



Chapter 6 Environmental Consequences

Badger
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Environmental
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6.1 Introduction to Effects

This chapter presents a summary comparison of the environmental effects of implementing the alternatives described in Chapter 2 on the current state of the physical environment, habitats and wildlife, cultural, and socioeconomic resources (as described in Chapters 3-5). The cumulative impacts associated with implementing Alternatives 1 through 4 are also addressed in this chapter.

The effects of each alternative's actions are measured against the current condition of Refuge habitats, wildlife, facilities, biological programs, and public use programs to determine the effect's magnitude. The effects of all alternatives, including Alternative 1, are based on expected change over the life of the Comprehensive Conservation Plan (CCP). For example, although Alternative 1 is identified as the status quo alternative, it is likely that public use will continue to grow over the next 15 years if no changes to Refuge management are implemented. The effects of this projected growth in visitation on wildlife, habitats, and the quality of public use programs are examined. Table 6-1 summarizes the effects of each alternative when compared to the current condition. At times, comparisons are made between the effects of alternatives (e.g., the effects of Alternative 1 in comparison to the effects of Alternative 2). When this occurs, the alternatives that are being compared are named. If no alternative is explicitly identified, then the comparison is being made against the current Refuge condition.

The information used in this CCP/EIS was obtained from Refuge staff members, the CCP planning team and extended team members personal knowledge of resources (based on field visits and experience), existing databases and inventories, consultations with other professionals, and relevant scientific literature. The terms identified below were used to describe the scope, scale, and intensity of effects on natural, cultural, and recreational resources.

- **Negligible.** Resources would not be affected, or the effects would be at or near the lowest level of detection. Resource conditions would not change, or the effects would be so slight that there would not be any measurable or perceptible consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource.
- **Minor.** Effects would be detectable but localized, small, and of little consequence to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource. Mitigation, if needed to offset adverse effects, would be easily implemented and successful.
- **Intermediate.** Effects would be readily detectable and localized, with consequences to a population, wildlife, or plant community, recreation opportunity, visitor experience, or cultural resource. Mitigation measures would be needed to offset adverse effects and would be extensive, moderately complicated to implement, and probably successful.
- **Significant (major).** Effects would be obvious and would result in substantial consequences to a population, wildlife or plant community, recreation opportunity, visitor experience, or cultural resource within the local area and region. Extensive mitigating measures may be needed to offset adverse effects and would be large-scale in nature, very complicated to implement, and may not have a guaranteed probability of success. In some instances, major effects would include the irretrievable loss of the resource.

Duration of effects has been defined as follows:

- **Short-term or temporary.** An effect that is anticipated to last less than a year or a season.
- **Long-term.** An effect anticipated to change a resource or its condition for longer than a year or a season.

Table 6-1. Summary of Potential Effects of CCP/EIS Alternatives for Deer Flat NWR

	Alternative 1	Alternative 2 (Preferred Alt.)	Alternative 3	Alternative 4
Effects to Wildlife, Habitats, and the Physical Environment				
Hydrology	Negligible. The Refuge has no control over lake levels and river flows. Refuge actions/activities have only an imperceptible influence on water use/quantity.			
Water quality	Negligible long-term negative effects due to increased motorboat use. Water quality in Lake Lowell is poor, due to actions beyond Service control. Refuge actions and activities have minimal contributions to water quality.	Negligible long-term negative effects due to increased motorboat use. Water quality in Lake Lowell is poor, due to actions beyond Service control. Refuge actions and activities have minimal contributions to water quality.	Negligible long-term positive effect due to restrictions on motorboat use. Water quality in Lake Lowell is poor, due to actions beyond Service control. Refuge actions and activities have minimal contributions to water quality.	
Air quality	Negligible long-term negative effects because increase in visitation would result in increased vehicle and motorboat use.	Negligible long-term negative effects because increase in visitation would result in increased vehicle and motorboat use.	Negligible long-term positive effect due to reduction in visitation and restrictions on motorboat use.	
		Minor short-term negative effects related to initiation of prescribed burns.		
Visual quality	Minor long-term negative effect due to increased visitation and no regulations to reduce wildlife disturbance and increase wildlife-viewing opportunities.	Negligible long-term effects. Negative effects of increased signage and construction are balanced out by increased quality of wildlife viewing and increased access to viewing opportunities.		
Open-water wildlife habitats and species	Intermediate to significant long-term negative effects. Wildlife species and habitats are subjected to increased day-time disturbances by high-speed boating and other water sports. Acreage of open water impacted by high-speed boating ≈ 6,400.	Minor long-term positive effects. Positive effects of small increases in no-wake zones would be balanced by negative effects caused by increased visitation. Acreage of open water impacted by high-speed boating ≈ 4,700.	Intermediate long-term positive effects by providing a large no-wake area and areas closed to all use. Acreage of open water impacted by high-speed boating ≈ 2,400.	Significant long-term positive effects due to eliminating high-speed boating on entire lake and reduction in visitation. Acreage of open water impacted by high-speed boating = 0.
Emergent beds and associated species	Significant long-term negative effects to nesting and feeding	Minor long-term positive effects due to providing no-wake zones adjacent	Intermediate long-term positive effects due to	Significant long-term positive effects due to the

	Alternative 1	Alternative 2 (Preferred Alt.)	Alternative 3	Alternative 4
	habitats for waterbirds, waterfowl, and shorebirds due to increased visitation, unrestricted public use, and minimal habitat management. There would be 0 acres of emergent beds protected from all uses and 280 acres buffered from high-speed boating by no-wake zones.	to shore areas of highest wildlife use and seasonal closures around nesting and feeding areas. The number of acres of emergent beds that are protected from all uses would vary because of dynamic seasonal closures, and 700 acres would be buffered from high-speed boating by no-wake zones.	closures of the southeast end of the lake as well as emergent beds between Parking Lots 3 and 8 and in Murphy's Neck and no-wake zones adjacent to most of these closed areas. There would be 680 acres of emergent beds protected from all uses because of closed areas and 210 acres buffered from high-speed boating by no-wake zones.	removal of wake-causing activities coupled with the closure of all emergent beds and the southeast end of the lake. There would be 870 acres of emergent beds protected from all uses because of closed areas and 40 acres buffered from high-speed boating by no-wake zones.
Riparian areas and associated species	Minor long-term negative effects as riparian habitat would continue to be subjected to a variety of impacts stemming from increased human use. These effects could be balanced by long-term positive effects if on-trail-only regulations are renewed and enforced.	Minor long-term positive effects due to implementing seasonal closures and on-trail-only regulations during sensitive nesting periods. Increases in visitation would reduce the positive impacts of these regulations.	Minor long-term positive effects from only allowing wildlife-dependent on-trail travel and improved habitat management. Construction of a boardwalk and increased use in the area of the boardwalk would negatively impact this portion of riparian habitat. Minor short-term negative effects related to construction of trail through riparian habitat.	Intermediate long-term positive effects from only allowing wildlife-dependent on-trail travel and improved habitat management.
Shrub-steppe habitat and associated species	Minor long-term negative effects as shrub-steppe habitat would continue to be subjected to a variety of impacts stemming from increased human use. These effects could be balanced by long-term positive effects if on-trail-only regulations are renewed and enforced.	Minor long-term positive effects related to seasonal trail use regulations, allowing nonwildlife-dependent uses on designated trails only, and proposed habitat improvements.	Intermediate long-term positive effects from allowing only on-trail wildlife-dependent activities, and improved habitat management.	Intermediate long-term positive effects from allowing only on-trail wildlife-dependent uses, improved habitat management, and a decrease in overall visitation.
		Minor short-term negative effects related to construction of new facilities and an additional trail on the Observation Hill Trail System.		

	Alternative 1	Alternative 2 (Preferred Alt.)	Alternative 3	Alternative 4
Mudflats and associated species	Intermediate long-term negative effects resulting from increased human-caused disturbance to mudflats and associated species. 560 acres of productive mudflat habitat would be open to disturbance.	Intermediate long-term positive effects resulting from both improved habitat management and seasonal to year-round public use closures. All productive mudflat acreage would be protected through seasonal closures.		Intermediate long-term positive effects due to year-round closure West Pool mudflats and adjacent waters, along with a year-round closure adjacent to the mudflats in the southeast end of the lake. All productive mudflat acreage would be protected through seasonal closures.
Waterfowl populations	Negligible effects to waterfowl populations and habitats from hunt program. Waterfowl harvest on the Refuge accounts for a small portion of the overall waterfowl numbers based on mid-winter surveys at both the Flyway and State levels, and harvest numbers are not expected to increase under any of the alternatives.			
Threatened and endangered species	Negligible effects as there are no known federally endangered, threatened, or candidate species that occur on the Refuge other than through occasional vagrant use.			
Effects to Public Uses and Human Environment				
Waterfowl hunting	Negligible long-term negative effect due to minimal control of invasive weeds affecting quality of hunt.	Minor long-term positive effect. Waterfowl hunt area would remain unchanged, except youth hunt area would be in an area previously closed to hunting.	Minor long-term negative effect. Waterfowl hunt areas would be reduced, but hunt quality should increase from reduced crowding.	Negligible effect. Similar to Alternative 3 except that the South Side Recreation Area waterfowl hunt area would be larger and the youth hunt area would be in an area previously closed to hunting.
Upland game hunting	Negligible long-term negative effect due to minimal control of invasive weeds. Upland hunt areas would remain unchanged.	Negligible effect on opportunities to enjoy quality upland hunting. Hunt areas would remain unchanged.	Minor long-term negative effect as the upland game bird hunt area would be reduced, but reduced disturbance from nonwildlife-dependent activities in the hunting area should increase hunt quality.	Significant long-term negative effect due to completely eliminating upland game bird hunting on the Lake Lowell Unit.
Big game hunting	Negligible long-term negative effect due to minimal control of	Negligible effects on opportunities to enjoy quality big game	Negligible to minor negative effects on opportunities to	Negligible effects on opportunities to enjoy quality big

	Alternative 1	Alternative 2 (Preferred Alt.)	Alternative 3	Alternative 4
	invasive weeds. Hunt areas would remain unchanged.	hunting. Hunt areas would remain unchanged. Anglers would have access to hunting area during hunting season.	enjoy quality big game hunting. Hunt areas remain unchanged. Only wildlife-dependent public use activities allowed in hunting zones, but proposed boardwalk may increase use by wildlife-dependent users.	game hunting. Hunt areas remain unchanged. Only wildlife-dependent public use activities allowed in hunting zones, which would reduce disturbance to target species and reduce safety concerns.
Fishing	Negligible long-term negative effects due to spread of invasive weeds and minimal weed management.	Minor long-term positive effect. Although access restrictions would increase, most fishing areas would remain accessible by boat. Habitat and access improvements would improve quality of fishing experience.	Intermediate long-term negative effect. Fishing access would be reduced with permanent on-water closures and increased no-wake zones. Improved access for bank fishing.	Significant long-term negative effect due to increased restriction in areas open to fishing compared to other alternatives and increased no-wake zones. Gotts Point would remain closed to vehicles.
Wildlife observation and photography	Minor long-term negative effect because access would be restricted to trails only. Recreational opportunities would otherwise remain unchanged.	Minor long-term positive effect. Off-trail access would be allowed in some areas year-round and in other areas seasonally. Additional viewing facilities would provide additional opportunities.	Negligible or minor long-term negative effect. No off-trail access would be allowed, but additional viewing facilities would provide additional opportunities.	Minor long-term negative effect. Similar to Alternative 3 except that fewer miles of trails and fewer viewing facilities would be available.
Environmental education	Negligible effects as current programs would be continued.	Minor long-term positive effect. Although emphasis would be on interpretation over EE, shift in EE to emphasize teacher-led, on-site programs would improve the quality of EE experiences. However, the number of EE participants would decrease.		Intermediate long-term positive effect. Similar to Alternatives 2 and 3 except that emphasis on EE over interpretation would increase number of guided opportunities.
Interpretation	Negligible effects as current programs would be continued.	Intermediate long-term positive effect. Emphasis would be on interpretation over EE, so there would be increased guided and unguided interpretive opportunities.		Intermediate long-term positive effect. Despite emphasis on EE over interpretation, there would be an increase in guided and unguided interpretive opportunities.

	Alternative 1	Alternative 2 (Preferred Alt.)	Alternative 3	Alternative 4
Water-based nonwildlife-dependent recreation	Negligible effects as current uses would be continued.	Minor long-term negative effect. Area accessible by boat would remain unchanged, but those areas would be subject to seasonal wildlife closures and more no-wake zones.	Intermediate long-term negative effect related to fewer swimming areas, more closed areas of lake, more no-wake zones, and slightly shorter boating season.	Significant long-term negative effect as no nonwildlife-dependent recreation would be allowed.
Land-based nonwildlife-dependent recreation	Negligible long-term negative effect, due to increases in visitation (if access continues off-trail). Minor long-term negative effect related to restricting access to trails only.	Minor long-term negative effects as nonwildlife-dependent activities would be allowed only on East Dike, Kingfisher, and Gotts Point Trails and the Observation Hill Trail System. In addition, walking with leashed pets would be allowed in the Lower Dam Recreation Area.	Significant long-term negative effects as dogs and horses would not be allowed and bicycling would be allowed only along the proposed trail adjacent to the entrance road.	Significant long-term negative effects. Similar to Alternative 3, but bicycling would not be allowed.
Cultural resources	Negligible to minor long-term negative effect due to inadequate inventory and interpretation of cultural resources.	Minor long-term positive effect from stronger inventory, evaluation, and protection of and education about cultural resources.	Minor long-term positive effect from stronger inventory, evaluation, and protection of and education about cultural resources.	Minor long-term positive effect from stronger inventory, evaluation, and protection of and education about cultural resources.
Environmental justice	Negligible effect due to maintaining current uses.	Minor long-term positive effect due to the potential to provide a positive effect on lower-income communities by increasing access to wildlife-dependent recreational opportunities.	Minor long-term negative effect through implementation of fees and the removal of swimming at the Upper Dam.	
Economic environment	Negligible long-term positive effect due to a direct increase of 21 jobs and \$979,000 added to the economy of Ada and Canyon counties. Total increase only accounts for less than 0.01% impact in these counties.	Negligible long-term positive effect due to a direct increase of 24 jobs and \$1.1 million added to the economy of Ada and Canyon counties. Total increase only accounts for less than 0.01% impact in these counties.	Negligible long-term positive effect due to a direct increase of 22 jobs and \$706,000 added to the economy of Ada and Canyon counties. Total increase only accounts for less than 0.01% impact in these counties.	Negligible long-term positive effect due to a direct increase of nine jobs and \$469,000 added to the economy of Ada and Canyon counties. Total increase only accounts for less than 0.01% impact in these counties.

6.2 Effects Common to All Alternatives

6.2.1 Integrated Pest Management

Potential effects to the biological and physical environment associated with the proposed site-, time-, and target-specific use of pesticides would be presented in Pesticide Use Proposals (PUPs) on the Refuge. PUPs and potential effects from chemical pest control would be evaluated using scientific information and analyses documented in Chemical Profiles (Appendix G). These profiles provide quantitative assessment and screening tools and threshold values to evaluate potential effects to species groups (birds, mammals, and fish) and environmental quality (water, soil, and air). PUPs (including appropriate best management practices [BMPs]) would be approved when the Chemical Profiles provide scientific evidence that potential impacts to the Refuge's biological resources and its physical environment are likely to be only minor, temporary, or localized in nature. Along with the selective use of pesticides, PUPs would also describe other appropriate integrated pest management (IPM) strategies (biological, physical, mechanical, and cultural methods) to eradicate, control, or contain pest species in order to achieve resource management objectives.

The effects of these nonpesticide IPM strategies to address pest species on Refuge lands would be similar to those effects described elsewhere within this chapter, where they are discussed specifically as habitat management techniques to achieve resource management objectives on the Refuge. For example, the effects of mowing to control invasive plants in an improved pasture would be similar to those effects summarized for mowing, where it would be specifically used to provide short-grass foraging habitat for wintering geese.

Based on scientific information and analyses documented in Chemical Profiles (Appendix G), most pesticides approved for use on Refuge lands would be of relatively low risk to nontarget organisms as a result of low toxicity or short-term persistence in the environment. Thus, potential impacts to Refuge resources and neighboring natural resources from pesticide applications would be expected to be minor, temporary, or localized in nature, except for certain mosquito treatments necessary to protect health and safety.

6.3 Effects to the Physical Environment

Topics addressed in this section consist of direct and indirect effects to hydrology, water quality, air quality, and visual quality.

6.3.1 Effects to Hydrology

None of the alternatives would be expected to have any measurable effect on the local hydrology. The water contained in the Refuge's Lake Lowell Unit is not controlled by it, and none of the action alternatives consider future activities that change the inflows or outflows associated with the operations of the reservoir. The Refuge also has no jurisdiction over the water in the Snake River, so actions considered in these alternatives would have no influence on regular in-stream flows or local hydrological patterns. A very slight change in the amount of water used in the surrounding landscape may occur due to vegetation restoration and removal adjacent to the lake. These changes should be imperceptible. The capacity of the lake may also be very slightly affected by water displacement

caused from additions of docks or any other in-water structure. Given the extremely low level of change to hydrology from the action alternatives, we anticipate that the effect would be negligible.

6.3.2 Effects to Water Quality

Lake Lowell is an impaired water body with multiple inputs coming from surrounding agricultural land and containing high concentrations of fertilizers and chemicals associated with farming practices. Under any of the alternatives, the Service would continue to work with other Federal and State agencies to identify and implement water quality improvements. Strategic planning that would have any effect on the long-term improvements of water quality cannot be undertaken without the full partnership with cooperating agencies.

With the action alternatives, the overall water quality, water chemistry, temperature, and risk of contaminant release would remain relatively unchanged. Negligible short-term impacts to water quality could occur under all alternatives, stemming from the control of invasive plant species and short-term sedimentation associated with construction and maintenance activities. All of the action alternatives include mechanical removal of shoreline vegetation, which has the potential to expose soils to wind and water erosion. These activities would include the use of BMPs, be confined to small areas, and be short-term in nature; therefore, mechanical removal of shoreline vegetation would not be expected to introduce substantial amounts of additional sediment into the lake.

The use of herbicides or pesticides to control invasive plants, which is included in the action alternatives, also poses several environmental risks, including drift, volatilization, persistence in the environment, water contamination, and harmful effects to wildlife (Hoshovsky and Randall 2000). In situations where mechanical and biological invasive plant control methods are ineffective, the Refuge may use approved herbicides in accordance with the Refuge's IPM program. The use of BMPs would reduce the risk of negative effects to water quality.

Removal of carp from Lake Lowell has potential to positively impact water quality. As explained in Chapter 4, by rooting around in muddy substrates while feeding, carp damage roots and stir up sediment, causing otherwise clear waters to become muddy (Kozfkay 2011). Sediment and organic material can then become suspended in the water column. The removal of carp under all alternatives is expected to decrease turbidity and improve water quality.

The operation of motorboats on the Refuge's Lake Lowell Unit would change across alternatives. In the Preferred Alternative (Alternative 2), boats would be allowed to operate on the lake as they have in the past with minor changes to no-wake zones and closed areas. In Alternatives 3 and 4, there may be a negligible long-term positive effect in water quality through a reduction in motorboat use due to wake restrictions and, under Alternative 4, the elimination of high-speed boating. The continued monitoring of motorboat use on the Lake Lowell Unit and enforcement of current and future Federal, State, and local laws that seek to reduce negative environmental effects associated with motorboats are expected to have a positive effect over the current state on both wildlife and visitor use.

Given that Alternative 1 would result in the greatest increase in visitation over time, it would have the most long-term negative effect on water quality when measured against current conditions. Given that the largest issues with water quality in Lake Lowell are derived from sedimentation, other issues created from return flows, and airborne contaminants, the small amount of positive or negative change occurring from Refuge management activities is expected to have a negligible effect on water

quality. Without having a full understanding of the horsepower, types, manufacture year, and usage of motors on the lake, it is impossible to quantify any potential impacts from changes in boating.

The operation of motorboats by visitors to the Snake River Islands Unit is difficult to calculate because visitors may also visit islands that are not part of the Refuge or may engage in in-river recreation in the river itself (e.g., fishing, hunting). Therefore, the amount of additional river usage by individuals solely visiting Refuge islands is unknown. Given the estimated visitation of the Refuge-owned islands and the fact that some of these visitors are disembarking on the islands while on the water for other purposes, travel to and from the islands is expected to have a negligible effect on water quality when measured against current conditions, under all alternatives.

6.3.3 Effects to Air Quality

The action alternatives would be expected to have negligible long-term effects to air quality compared to current management. Proposed restoration activities may result in temporary increases in vehicle emissions (from tractors and heavy equipment) due to the proposed restoration and construction activities identified in the action alternatives. In Alternatives 1 and 2, a slight increase in vehicular and motorboat emissions could be expected over time due to an increase in visitation over time from the current condition, while a decrease in visitation could be expected to decrease vehicular and motorboat emissions in Alternatives 3 and 4. Given the reduction in visitation and the no-wake speeds expected in Alternative 4, there may be a long-term positive effect on air quality when compared to the current state. However, the magnitude of the effect on county-wide air quality is difficult to calculate and would most likely be negligible.

Some minor short-term negative impacts to local air quality may result from the use of prescribed fire. Historically, prescribed fire has been used on the Refuge as a means of controlling or rehabilitating plant communities. The use of prescribed fire is proposed in all of the action alternatives to enhance both the upland and riparian habitats around the Refuge. Fire performs several important functions in these habitats including increased nutrient availability, suppression of woody vegetation, removal of thatch, and exposing of bare soil for seed germination. Prescribed fire may be used to control undesirable vegetation such as cheatgrass and monocultures of false indigo and cattails. Smoke produced by prescribed burns may temporarily impact local air quality, wildlife habitat and visitor experience. According to the Service's Clean Air Act directives, it is our policy to:

protect and enhance the quality of the Nation's air resources to promote the conservation of fish and wildlife resources, and to protect the public health and welfare and the productive capacity of populations. In order to accomplish this, we will comply with all applicable Federal, interstate, State, regional, and local air quality regulations ([561 FW 2.2](#), Clean Air Act).

In addition, prescribed fire management directive states the following:

Prescribed fire and other hazardous fuel treatments must comply with the National Environmental Policy Act (NEPA) and other legislation and policies related to endangered species, air quality, ... ([621 FW 1](#), Fire Management Program 1.16, D.)

Local residents' acceptance of Refuge decisions to use prescribed fire and tolerance of short-term impacts to air quality sometimes depend on the areal extent of the treatment, the degree of planning that precedes implementation, the adequacy of the resources (human, equipment, and fiscal) available to the managing agency, and the proximity of the fuel treatment to developed areas (Winter et al.

2002). In all alternatives, the Service would work with the local communities and minimize adverse air quality impacts through participation in the Montana/Idaho Airshed Group. The group members consist of Federal, Tribal, State and private land managers in Idaho and Montana. The intent of the Airshed Group smoke management program is to minimize or prevent smoke impacts while using fire to accomplish land management objectives.

The combustion products (smoke) from forest wildfires or prescribed burns can affect visibility and the quality of life of certain population subgroups that are particularly smoke-sensitive, including those with respiratory ailments such as asthma (Winter et al. 2002). According to regional fire management staff, these impacts can be minimized by proper timing and preparation for burning. Under all alternatives, the Southeast Idaho National Wildlife Refuge Complex Fire Management Officer submits a list of planned burn projects to an online database managed by the Smoke Management Unit (SMU) in Missoula, Montana (<http://www.smokemu.org/index.cfm>). Information about each burn project consists of the type of burn, fuel type and loading, number of acres in each unit, legal location, and elevation. Each burn unit is assigned an identification number. The day before the planned ignition, the burn boss accesses the online SMU database to submit a proposed prescribed burn for the following day.

The SMU meteorologist then develops a daily smoke dispersion forecast by airshed and posts to the SMU website. The SMU smoke management program coordinator develops daily burn unit recommendations during spring and fall and posts to the SMU website. In addition, IDEQ may review the dispersion forecast and burn proposals daily and relay any issues or concerns to the SMU.

The SMU issues daily decisions, which can recommend against burning when atmospheric conditions do not allow good smoke dispersion. Restrictions may be directed by airshed, elevation, or special impact zones around populated areas. The burn boss accesses the daily decision notice from the SMU website the day before planned ignition. In all alternatives, prescribed burn projects would only be conducted when the SMU does not post a burning restriction for the Refuge's airshed.

No nonattainment areas are located in or near the Refuge, and specific smoke-sensitive areas are identified in individual burn plans. Appropriate mitigation measures have been identified for all alternatives.

The Refuge prepared a fire management plan in 2009, which guides the Refuge's wildland fire and prescribed fire programs (Appendix K). This plan defines levels of protection needed to provide for firefighter and public safety, protect facilities and resources, and restore and perpetuate natural processes affected by fire. The plan also defines levels of ambient air quality that would postpone fire use. The plan is written to comply with a Service-wide requirement that refuges with burnable vegetation develop a fire management plan (620 DM 1).

Many of the strategies applied to reaching this plan's goals and objectives included various methods of vegetation management. In addition to fire, these include chemical, biological, and mechanical control. Herbicide application may result in drift that could contribute to localized, air quality impacts. Because applicators are trained to minimize drift (by managing droplet size and only applying during light winds—less than 10 miles per hour) and any drift would rapidly dissipate, this effect is expected to be negligible under all alternatives. Emissions from heavy equipment, tractors, ATVs, and passenger vehicles used during spraying and transit to and from restoration areas would also have a small impact on air quality. This impact is also expected to be negligible and short-term

due to the limited amount of rehabilitation planned, standard compliance with BMPs, and the offsetting benefits of habitat improvements.

Overall, the strategies proposed in the action alternatives are expected to have a negligible long-term and minor short-term (during the period of burning) effects on air quality.

6.3.4 Effects to Visual Quality

The implementation of any of the action alternatives is expected to have minor effects on visual quality (i.e., scenery). Kiosks and docks would be placed in strategic locations. These additions would be designed to enhance visitors' ability to appreciate natural or cultural resources within the immediate area and are expected to have a negligible effect on visual quality. The largest proposed construction project would be a two-mile boardwalk between Parking Lots 1 and 3 on Lake Lowell Unit's south side under Alternative 3. This project is proposed within the treed area on the Refuge's south side and should mostly be hidden from those on the water and in the upland, as well as drivers passing by. The area's most common public uses are waterfowl and upland hunting; the proposed boardwalk could potentially have a significant long-term effect on riparian area waterfowl hunters. Larger construction projects are slated for the Lower Dam Recreation Area, already developed with parking areas, bathrooms, and buildings. Any changes to the Lower Dam Recreation Area should have negligible impacts to its visual quality.

Although construction of new facilities may have some negative impact on visual quality, they would be designed to help enhance the visitor's experience of the scenic beauty of the Refuge by providing access to new Refuge areas, guidance to visually interesting portions of the Refuge, and/or better access to currently used areas (e.g., docks).

If buoys or signs are used to identify no-wake zones and closed areas, the shoreline view for on-water users may be degraded. The increase in signage required to designate no-wake and/or closed areas along the perimeter of the lake in Alternatives 3 and 4 would cause a negative long-term effect to visual quality of the shoreline from the water. However, these restrictions on use would also have a positive impact on visual quality by reducing disturbance and allowing better wildlife viewing. Because the closed areas would be adjusted to coincide with nesting areas in Alternative 2, the amount of necessary signage/buoys would probably lead to a negligible long-term effect by increasing both the amount of signage and viewable wildlife.

The expected reduction of users in Alternative 4 could increase each visitor's ability to enjoy the scenic beauty of the Refuge, while a large projected increase in users under Alternatives 1 and 2 could detract from the visual quality. Visitation under Alternative 3 is expected to increase slightly providing a negligible effect on visual quality.

The action alternatives are expected to have negative effects on visual quality from new construction and signage, while they are expected to have positive effects on visual quality from increased access, increased user knowledge, decreased habitat disturbance, and, in Alternative 4, decreased interaction with other visitors. Because of the positive and negative long-term effects expected within the action alternatives, the overall effect would be negligible. The increase in visitation under Alternative 1 is expected to negatively impact visual quality. Without regulations in place to reduce disturbance to Refuge habitats, this alternative is expected to have a minor long-term negative effect on visual quality.

6.4 Effects to Wildlife and Habitats

Changes in habitat and public use management can have both positive and negative effects on wildlife and habitats. The same action (e.g., invasive species control) can have both beneficial effects (e.g., removal of undesirable vegetation) and negative impacts (e.g., removal of nontarget species through overspray). Even keeping the status quo (Alternative 1) can have negative effects on Refuge habitats over time. For example, the current invasive species control programs involves opportunistically treating invasive species as they are located if time and resources permit. If this type of invasive species control were allowed to continue, Refuge habitats would be impacted negatively as the undesirable plants were allowed to continue spreading.

Facilities associated with public uses can also cause irreversible habitat loss or modification. General locations for new or modified facilities have been indicated in the strategies under Goals 1, 3, and 4 and identified on the public use maps for each alternative (Maps 4-9). Exact dimensions and locations for new facilities would be determined in the site design stage, prior to construction. Most of these structures (i.e., trails and a visitor contact station) would be placed in shrub-steppe areas; accordingly, most of the habitat loss due to facilities is addressed under this habitat type. A few other projects (i.e., docks, boardwalk, canoe/kayak launches) may impact small portions of emergent beds or riparian habitat.

Effects of actions from each alternative on wildlife and habitats, measured against the current condition of the Refuge, are addressed within each specific habitat type below. Because waterfowl use many types of habitats, use the Refuge in all seasons, and are addressed in multistate planning efforts, effects to waterfowl species are discussed separately (Section 6.4.6). Effects to threatened and endangered species are also covered separately (Section 6.4.7).

6.4.1 Effects to Open-water Habitat and Associated Wildlife: Lake Lowell

Open-water habitat refers to the limnetic zone or the water that is well lit, free of emergent vegetation and is typically away from the shore of the lake. At full pool there are approximately 6,400 acres of open-water habitat on Lake Lowell but that number drops in the late summer and early fall as demands for irrigation increase. Although Lake Lowell is not a natural lake and requires human manipulation to maintain, the habitats created by the reservoir are especially important to local and migratory wildlife looking for suitable water sources in the highly degraded Snake River Plain and shrub-steppe desert. Wildlife species that rely on the open water of Lake Lowell include but are not limited to ducks, geese, gulls, pelicans, grebes, osprey, bald eagles, beavers, muskrats, and various species of fish, amphibians, and aquatic invertebrates. Other species of wildlife, such as deer, coyotes, badgers, most hawks and owls, passerine birds, snakes, and terrestrial invertebrates, are likely to use the open-water habitat periodically but are not reliant on it for their existence.

Alternative 1: Under the status quo alternative, open-water habitat would continue to be subjected to a variety of impacts stemming from human use and presence. There would continue to be no use restrictions throughout the majority of the lake, and current closures may not adequately protect trust resources. Avian species that rely on the open water for food and space, such as pelicans, grebes and gulls, would continue to be a secondary consideration behind nonwildlife-dependent recreational uses of the Refuge. A number of species that use open-water habitat would continue to be subjected to long-term negative impacts during daylight hours from April to September. The productivity of these species at Lake Lowell could continue to decline as motorboating and other water sports

continue to increase on the reservoir, impacting approximately 6,400 acres of open water. It is anticipated that most species of wildlife using the lake would be subjected to general impacts of human presence, but some species like nesting grebes and herons would be more susceptible to the impact of boating traffic on open water because of their reliance on this habitat for feeding, nesting, and escape from predators.

Alternative 2: Under the Preferred Alternative, more open-water habitat and associated wildlife would be protected from the effects of human presence, with expanded and strategically placed no-wake zones along with seasonal closures of sensitive nesting areas that extend into the open-water habitat. Space with reduced or no human intrusion would be available for species that depend on open water. High-speed boating would still impact 4,700 acres of open-water habitat. Impact to most wildlife species would be more or less uniform as provisions in this alternative specifically target species that are more susceptible to impacts stemming from open-water recreational activities.

Alternative 3: Tow-behind or wake-causing activities (e.g., water skiing, wake boarding, and tubing) would be restricted to the West Pool of the lake and the remainder would be considered a no-wake zone. The southeast portion of the open-water habitat on Lake Lowell would be closed and considered a sanctuary. More open-water habitat would be set aside for wildlife and nonwildlife-dependent recreation would be restricted to portions of the lake that would likely have only minor negative impacts to wildlife. High-speed boating would still impact approximately 2,370 acres of open-water habitat.

Alternative 4: All open-water habitat on Lake Lowell would be restricted to no-wake speeds, and the southeast end would be closed and considered a sanctuary. Human activity would be restricted to only wildlife-dependent recreation, and impacts to wildlife would likely be negligible. Under this alternative, no open-water habitat would be impacted by high-speed boating. Impacts to wildlife species under this alternative would be minimal because a blanket protection would be provided Refuge-wide.

6.4.1.1 Effects of Wildlife and Habitat Management Actions

All on-water management activities may have short-term or temporary negative impacts to wildlife due to the presence of Refuge personnel near wildlife using open-water habitats. Because these activities are short-term and are intended to improve long-term conditions, any negative effects to grebes are expected to be negligible and far outweighed by intended positive effects. The removal of carp is expected to have significant long-term positive effects on open-water habitats. The population of carp in Lake Lowell is estimated at 1.2 million (IDFG 2010a). Carp are thought to represent a high threat to the submerged vegetation's ecological functions due to their impacts on submergent vegetation and water quality. Treatments using the natural plant chemical rotenone are expensive, not target-specific, and may not be practical for a lake the size of Lake Lowell. Although elimination of carp is not expected, reduction in carp numbers would positively affect Refuge habitats. Carp removal is proposed under all alternatives.

IDFG recommended three options for substantial carp reduction: physical control such as seining, a yet-to-be studied biological control using a koi-herpes virus, or chemical control using a rotenone treatment applied to the lake in extreme low water and/or low storage years. It is thought that physical control may not be the best option for controlling carp at Lake Lowell for four reasons: the size of Lake Lowell, age of the carp found (young), carp's reproduction success in the lake, and high natural mortality for these carp. These same characteristics may indicate that suppression of

spawning could result in an overall reduction in the population (IDFG 2010a). Although rotenone has the potential to depress the carp population for a period of time, carp populations would rebound if not continually managed after treatment with rotenone. For example, carp populations in Lake Lowell were decreased with rotenone in the 1960s, but have grown over time to reach current levels.

Studies on carp movement conducted by IDFG, as well as future research into the currently untested use of koi-herpes virus, should assist in determining the most beneficial removal process. These removal techniques have the potential to cause both significant positive and negative effects. The negative effects of physical control include the complications of by-catch (i.e., nontarget species being killed or injured). Because all fish species in Lake Lowell are nonnative and were stocked at some point, injury or removal is not as much of a concern as if they were native species. Because these species can be restocked, the impact should be short-term and of limited scope.

Chemical and biological controls may have unforeseen consequences that could cause negative impacts to nontarget species. Unfortunately, we have no way of knowing what these impacts may be, how long they may persist, or how destructive they may be. Working with the Service's Regional biologists to assess each type of control method before it is used, based on use elsewhere, should reduce unforeseen impacts. If mechanical control techniques are used, there is expected to be negligible short-term negative impacts to nontarget species. The removal of carp from Lake Lowell would likely have a significant long-term positive effect on the vegetation and invertebrate communities as well as the water quality.

Effects from different approaches to carp control:

Under the Action Alternatives, a variety of approaches may be used at Deer Flat Refuge (following further assessment) to achieve the stated target and restore vegetative cover. Approaches may include non-selective removal or exclusion devices such as the application of piscicide; use of barriers; or water manipulation. Selective devices such as commercial harvest and recreational angling may also be used. Chemo-attractants or chemorepellents may be used in conjunction with any of these methods. The following paragraphs specifically examine the effect of usage of piscicide (specifically rotenone), angling, commercial harvest and chemo-attractants/chemo-repellents. Barriers could also encompass a wide range of potential designs but there is no design in place and therefore will not be further analyzed. Water manipulation is unlikely to be used as a tool for the Refuge's lacustrine habitats due to the sheer size of the lake and the inability to alter any irrigational use for wildlife purposes without substantial coordination with other agencies.

Piscicides:

Piscicides are chemicals that kill fish. Rotenone is a natural substance derived from several tropical and sub-tropical plants. It is a broad-spectrum piscicide that is toxic to most fish over the range at which it is toxic to carp. For carp, it is known to be toxic to juvenile and adult fish. An overview of the effects of rotenone is available in a Reclamation document developed for a Bonita Creek (Arizona) project (USBR 2010). Fish eggs are much more resistant to rotenone treatments than larval or adult stages. For example, newly fertilized rainbow trout eggs were 41 to 106 times more resistant; salmon eggs are 10 times more resistant than the fish; and carp eggs are 50 times more resistant (Oregon Department of Fish and Wildlife [ODFW] date unknown).

Although both fish and aquatic macroinvertebrates are highly susceptible to rotenone (Skaar 2001), most macroinvertebrate populations quickly recover to pretreatment levels (Lennon 1970; Schnick

1974b). Gill-breathing amphibians (i.e., frog and toad tadpoles and larval salamanders) are also adversely affected (Hamilton 1941). Amphibian adults and reptiles are less sensitive than fish and should not be harmed when rotenone is applied at concentrations typically used in fisheries management (Farringer 1972). Fall applications of rotenone reduce or eliminate impacts on amphibians because most species are in the adult stage of development.

Rotenone is very unstable in the environment (half-life measured in days) and completely breaks down within 1-4 weeks depending on pH, alkalinity, temperature, dilution, and exposure to sunlight (Schnick 1974). It also adsorbs strongly to organic matter in sediment and is rapidly degraded (Dawson et al. 1983). Rapid neutralization (oxidation) occurs when rotenone is mixed with potassium permanganate or sodium permanganate (Engstrom-Heg 1971; Finlayson et al. 2000). Inert ingredients in the liquid formulation of rotenone consist of petroleum hydrocarbons as solvents and emulsifiers (primarily naphthalene, methylnaphthalenes, trichloroethylene, and xylenes). Studies of residual concentrations in water treated with liquid formulations indicate that solvent levels are below toxic thresholds (Ling 2003).

Commercial harvest:

Commercial harvest has the potential to be an important tool in the control of carp in Lake Lowell. It has been successfully used in several locations, including Utah Lake, Utah. Meronek et al. (1996) conducted a review of fish control projects and found that success rates for physical removal methods ranged from 33 percent to 57 percent. A recently released study (Weber et al. 2011) modeled the effect of commercial harvest of carp on size structure, abundance, and egg production, recruitment, and growth. The study found exploitation simulations in which a 575-mm (22.6 inches) length restriction represented commercial gear selectivity. Simulated common carp size structure declined modestly (9%-37%) in all simulations. The abundance of common carp declined dramatically (28%-56% of starting levels) at low levels of exploitation (0%-20%), but exploitation greater than 40 percent had little additive effect, the final populations only being reduced 49 percent to 79 percent despite high exploitation (>90%). At a moderate level of exploitation (40%), maximum lifetime egg production was reduced to 77 percent to 89 percent of starting levels, indicating the potential for recruitment overfishing. Exploitation further reduced common carp size structure, abundance, and egg production when simulations were not size selective.

Commercial harvest currently occurs on Lake Lowell but it is a small operation. Large-scale operation is being explored in cooperation with the IDFG and a commercial company that is actively seeking places with carp infestations. If used, fishing would be limited to seasons and locations that would minimize disturbance to lake wildlife and native fish. In addition to the likely positive effects of reducing carp abundance, egg production, and size structure, commercial fishing may lead to negative short-term impacts on water quality (increased turbidity) and the aquatic habitat (benthic disturbance).

Non-commercial angling:

This method may include bow-hunting or other methods used by recreational anglers to catch fish. Fishing effects are explored in the Fishing CD in Appendix B. This method is likely to have negligible effects on the population of carp due to the huge population in existence and the small number of anglers that actively target carp.

Chemo-attractants and/or chemo-repellants:

These may be used in conjunction with one or more of the techniques mentioned above. Pheromones (as a particular class of natural chemo-attractants and repellents) are recognized as potent modulators of behavior (and physiology) that may be effectively used to attract, repel, or guide fish movement, and/or disrupt normal mating behavior (Sorensen and Stacey 2004). When developed and deployed together with other techniques as part of an integrated approach, they may have the potential to greatly increase the efficiency of control efforts (Sorensen and Stacey 2004). A variety of different pheromones are produced by any individual species, some of which are species-specific and others not (Sorensen 2006). According to Sorensen and Vrieze (2003), pheromones have the distinct advantages of being potent, easy, and potentially inexpensive to produce and apply, and environmentally benign. However, as discussed by Sorensen and Hoyer (2007), the challenge of isolating and applying pheromones for any species is likely to be considerable. In the case of the sea lamprey migratory pheromone, it took a large team over 16 years to identify three components at a cost of over a million dollars. Therefore, use of pheromone technology (except experimentally) may be premature, since pheromones used for pest control in the United States are considered “pesticides” by the Environmental Protection Agency (EPA) and must pass through the normal pesticide registration process. In addition, the normal procedures prior to use of a pesticide would apply, requiring considerable time and funds. Experimental use in the research phase must also have a special permit. Effects would need to be further developed in a pesticide use proposal (PUP).

Vegetation removal to create a more diverse interface between open water and emergent vegetation habitat is also a goal in the action alternatives. Marsh birds (e.g., egrets, herons, ibis) can often be seen along the open water and emergent vegetation interface foraging for food. Western and Clark’s grebes nest in the emergent vegetation but need access to open water in order to feed and brood their young. Removal of some sections of the smartweed bed to create more edge effect may have minor short-term impacts to the open-water habitat through resuspension of sediment, reduced oxygen content, and disturbance to fish and wildlife in the immediate vicinity. These modification effects would likely have a minor long-term positive impact on most wildlife in this habitat and a moderate to significant long-term positive effect on nesting grebes.

Conducting wildlife surveys, monitoring, and inventory also have the potential to affect wildlife that use the open water. For instance, during grebe brood count surveys, biologists using motorboats routinely displace and disturb groups of grebes foraging and rearing their young in the open water. Waterfowl, secretive marsh birds, and raptors all tend to flush and escape the presence of humans even when those humans are trying to study them. The negative effects associated with the work of researchers on Lake Lowell are expected to be short-term and minor. Biologists are typically very aware of the effects of their presence and attempt to minimize disturbance. The Refuge provides food and space (in the way of closed areas and time restrictions for recreational use) for flushed wildlife to restore energy levels that may be depleted by disturbance. The purpose of research and studies is to determine criteria for which management can make decisions to improve conditions for wildlife thereby mitigating disturbance effects.

6.4.1.2 Effects of Public Use and Public Use Management

General responses of wildlife and habitat to human disturbance have been described in many sources. Immediate responses by wildlife to human presence can range from behavioral changes including nest abandonment, altered nest placement, and change in food habits to physiological changes such as elevated heart rates, increased energetic costs due to flight or flushing, and even death (Belanger

and Bedard 1990; Kight and Swaddle 2007; Knight and Cole 1995a; Miller and Hobbs 2000; Miller et al. 1998; Morton et al. 1989). The long-term effects are more difficult to assess but may include altered behavior, vigor, productivity, or death of individuals; altered population abundance, distribution, or demographics; and altered community species composition and interactions.

According to Knight and Cole (1991), there are three wildlife responses to human disturbance: avoidance, habituation, and attraction. The magnitude of the avoidance response may depend on a number of factors including the type, distance, movement pattern, speed, and duration of the disturbance; the time of day, year, and weather; and the animal's access to food and cover, energy demands, and reproductive status (Fernández-Juricic et al. 2007; Gabrielsen and Smith 1995; Knight and Cole 1991). Studies have shown that the severity of effects depends upon the disturbance distance to the animal(s) and the disturbance's duration, frequency, predictability, and visibility to wildlife (Burger 1998; Knight and Cole 1991; Miller et al. 1998; Rodgers and Smith 1997; Vos et al. 1985). Habituation is defined as a form of learning in which individuals stop responding to stimuli that carry no reinforcing consequences for the individuals that are exposed to them (Alcock 1993). A key factor for predicting how wildlife would respond to disturbance is predictability. Often, when a use is predictable—following a trail or boardwalk or at a viewing deck—wildlife will habituate to and accept human presence (Oberbillig 2000). Gabrielsen and Smith (1995) suggest that most animals seem to have a greater defense response to humans moving unpredictably in the terrain than to humans following a distinct (and repeated) path. The third response, attraction, can be a variety of different scenarios—for example, bears habitually feeding on landfills or campsite dumpsters. Attraction can also be associated with the Refuge's purpose to provide and maintain habitats and suitable conditions for wildlife use, either naturally or through management actions.

Habitats on which wildlife species rely may also be impacted by visitor use under all alternatives. Unpaved or unsurfaced trails are susceptible to a variety of impacts from recreationists, including vegetation loss due to trampling, soil compaction, and erosion (Adkison and Jackson 1996; Dale and Weaver 1974; Leung and Marion 1996). Trail widening and creation of side trailing (social trailing) increases the area of disturbed land (Liddle 1975).

Clark's and western grebes exemplify species that experience the negative impacts caused by unrestricted public use of open-water habitats. Grebes nest in the emergent beds of Lake Lowell and rear their young in the open water, typically from June through October. During the 2010 and 2011 nesting season, as water levels dropped and feeding habitat became shallower, grebes moved more into the open water. Grebe chicks are altricial (dependent on adults for protection) and ride between the wings on their parents' back until they are two to four weeks old. Back-brooding is essential for survival of young chicks as their plumage is not developed to withstand long periods of swimming and they are not adapted to loaf on shore (Storer and Nuechterlein 1992). As grebes move more into the open water, the potential for disturbance by open-water recreational activities is greatly increased. High-speed boating leads to disruption of feeding areas, which may lead to a loss of production and displacement of waterbirds from preferred habitats (Burger 1997). Grebe adults and chicks are often killed by boats (Ivey 2004; Shaw 1998) and small chicks can become separated from their parents and die of exposure if adults have to dive to avoid motorboats (Storer and Nuechterlein 1992). Current recreational uses on Lake Lowell have the potential to cause significant effects on the nesting population of grebes.

Shorebirds are also negatively impacted by public use of open water. Public use may affect them through disturbance effects associated with close proximity to feeding and resting areas. The scope of

disturbance depends on public use activities, size of the group(s), season of use, and activity's location and duration.

Mudflats used most by shorebirds are those near the New York Canal at the east end of the lake. Even though this area is within a no-wake zone, the open water and adjacent emergent beds (if flooded) are open to boaters until September 30. The area's recreational activities can disturb migrating shorebirds. The consequences of human disturbance, in terms of physical condition or survival, are currently unknown (Fernández et al. 2010), but studies have shown that shorebirds avoid areas of higher disturbance. For example, when comparing bird response on paired lower and higher use days at trail sites, a study in California found the number of shorebirds decreased with increasing trail use, with higher trail-use days averaging 25 percent fewer birds than on lower use days (Trulio and Sokale 2008). Increased public use adjacent to shorebird feeding and resting areas would cause a negative impact by decreasing their ability to use these habitats.

Waterfowl are also expected to be negatively impacted by increased public use of open water areas. Boating impacts on waterfowl depend on the noise, speed, and proximity of watercraft (Cywinski 2004). Some impacts of watercraft (powerboats or personal watercraft) on waterfowl include flushing and disturbance. Flushing tends to reduce the time waterfowl spend feeding and causes them to feed at night or to leave prime feeding grounds. Flushing also increases the energy expenditure of waterfowl, which can reduce their ability to complete migration or successfully reproduce in the next breeding season. For migrating and wintering waterfowl, effects include increased energy expenditure and depleted fat reserves and potential changes in migration patterns (Korschgen and Dahlgren 1992). In a disturbance study on Lake Erie, birds flew away from the disturbance, altering the diving ducks' daily patterns of habitat use as the ducks tended to leave a preferred feeding area for a suboptimal area (Knapton et al. 2000).

Using the general effects and response information explained above as well as knowledge of Refuge-specific species, the following effects are expected for the various alternatives.

Alternative 1: A significant amount of human activity occurs in the open-water habitat of Lake Lowell. In a 2011 lake use study conducted by the U.S. Geological Survey (USGS) (Appendix L), 74 percent of users were active in the open-water habitat of Lake Lowell. Because there would be virtually no change to public use regulations on the Refuge and public use is estimated to increase over time, there would be a significant long-term negative impact to wildlife from human disturbance. All 6,400 acres of open-water habitat would be open to high-speed boating in this alternative.

Alternative 2: The increase in open-water areas closed to high-speed boating (through the implementation of no-wake zones) should provide a minor long-term positive effect on wildlife using those areas relative to the current state. The no-wake zone in the Narrows and on the southeast end of the lake would reduce the speed and potentially noise caused by watercraft. It may also reduce the number of craft using those particular areas. Taking into account the research cited above, the reduction in speed, noise, and use in these areas should positively impact shorebirds, waterfowl, and grebes by providing less-disturbed areas to feed and rest. However, an increase in overall visitation is likely to increase use in areas where high-speed boating is allowed, causing a minor long-term negative effect in these areas. The positive and negative aspects of this alternative cancel each other out, leaving a negligible effect on open-water habitat and the wildlife associated with it. In this alternative, 4,700 acres (73 percent) of open-water habitat would be open to high-speed boating activities.

Alternative 3: Alternative 3 would have an intermediate long-term positive on wildlife using open-water habitats by providing a large no-wake area (the entire East Pool) and a substantial portion of open water that would be closed to all use (at the southeast end). The open-water closure encompasses or is adjacent to areas where shorebird feed and rest; areas where grebes nest, feed, and rest; and open-water areas highly used by waterfowl. The closed area would provide an undisturbed opportunity for waterfowl, grebes, and shorebirds, as well as other wildlife, to feed and rest. It would also reduce disturbance to nesting areas. The no-wake zone and closed area would provide an area of reduced disturbance that would encompass or be adjacent to areas that are currently the highest used habitats on the lake for wildlife feeding, nesting, and resting and would therefore provide an intermediate long-term positive effect on wildlife and habitats. Only a modest increase in visitation is expected under Alternative 3, which should not create the same negative effects as expected in Alternative 2. Approximately 2,370 acres (37 percent) of the lake would be exposed to high-speed boating activities under this alternative.

Alternative 4: Alternative 4 would have a significant long-term positive impact to wildlife and open-water habitat by reducing human-caused disturbance on the entire lake. The closed area in the southeast end of the lake would be the same size as the closed area in Alternative 3; however, the no-wake zone covering the entire lake would provide a greater reduction in human disturbance on the lake. All nesting, feeding, and resting areas on the lake would be free of high-speed boating and most likely experience less visitation; therefore, these areas would be less disturbed by noise, wake, speed, and human presence.

6.4.1.3 Overall Effects

The majority of effects to wildlife that use the open-water habitat associated with the Refuge would be positive, when compared to the current condition, under the three action alternatives. By design, these alternatives seek to deviate from the status quo in order to decrease human disturbance in the open-water habitat. The reduction of invasive carp, modification of habitat, and research under all alternatives would benefit Refuge fish and wildlife. The proposed no-wake zones and closures in Alternatives 3 and 4 would add to these benefits. With a slight increase in public use, Alternative 3 is expected to provide intermediate long-term positive effects. With the decrease in public use that is expected under Alternative 4, a significant long-term positive effect is expected. The expected increase in public use under Alternative 1, with a lack of reduced disturbance zones for wildlife, would result in intermediate to significant negative consequences for Refuge wildlife (particularly for migratory birds). The increase in visitation under Alternative 2 would lessen the positive effects of proposed no-wake zones and habitat improvements, resulting in only minor long-term positive effects.

6.4.2 Effects to Emergent-bed Habitat and Associated Wildlife: Lake Lowell

Emergent-bed habitat refers to the vegetative zone characterized by inundated weed beds and other flooded vegetation that is typically adjacent to open-water habitat. At full pool, there are approximately 845 acres of emergent-bed habitat on the Lake Lowell Unit, but that number drops in the late summer and early fall as demands for irrigation increase. The Snake River Islands Unit may have a small amount of emergent-bed habitat, but jurisdictional boundaries limit the ability of Service staff to implement appropriate management strategies. Again, even though Lake Lowell is not a natural lake and requires human manipulation to maintain, the habitat created by the reservoir is especially important to local and migratory wildlife looking for suitable water sources in the highly

degraded Snake River Plain and shrub-steppe desert. Emergent beds are particularly desirable in that they are considered some of the most productive habitats on earth (Novitzki et al. 1999). Grebes at Lake Lowell nest in the emergent beds and large nesting colonies have been noted along the south shore of Lake Lowell. Although regular grebe nesting surveys were not conducted until 2010, references to nesting grebes have occurred regularly in Refuge files and historical Refuge pamphlets. The shoreline and emergent vegetation provide important habitat for a wide variety of wildlife, but these areas are especially important for nesting and breeding grebes in Idaho (IDFG 2005). In order to protect this habitat, the Refuge has proposed different measures to provide grebes and other waterbirds opportunities to nest, forage, and rest with minimal disturbance. Eleven species of waterfowl, including mallard, cinnamon teal, wood duck, and gadwall, nest around the lake edges and rear their young in the open water, typically in the early summer. Other wildlife species that rely on the emergent beds of Lake Lowell include but are not limited to pelicans, herons, egrets, fish, amphibians, and aquatic invertebrates. Deer, coyotes, badgers, most hawks and owls, passerine birds, snakes, and terrestrial invertebrates likely use emergent vegetation periodically but are not reliant on it for their existence.

All Alternatives: The carp removal project would continue and would expect to realize wildlife and habitat benefits as the population of carp in Lake Lowell is reduced. Water quality and other research and investigations would increase with the help of partners.

Alternative 1: No changes would be made to public use activities or habitat and wildlife management above and beyond those listed in Section 6.2. Nesting, feeding, and resting grebes, herons, eagles, waterfowl, and other wildlife would be increasingly disturbed by proximity of the public as visitation continues to grow. As a result, Alternative would have intermediate to significant long-term negative impacts to these species.

Action Alternatives (2-4): Habitat management would include a more strategic approach to invasive species management, opening channels to provide access to open water, increases in research and monitoring, over Alternative 1, and identification of optimal water levels for emergent beds. Public use management actions include increases in no-wake zones and closed areas (seasonally closed in Alternative 2) to reduce human disturbance to wildlife.

6.4.2.1 Effects of Management Actions

Management actions proposed as part of this CCP/EIS are intended to provide long-term positive effects to wildlife species including waterfowl and grebes. The action alternatives propose strategies that would improve wildlife habitat by creating a diverse assemblage of native plants, reducing the amount of invasive species, and reducing the amount of human disturbance in sensitive areas. Some management actions may have short-term or temporary negative impacts to waterfowl or grebes by removing vegetation, manipulating water levels, and causing short-term disturbances such as the use of heavy equipment. These activities are short-term, temporary habitat modifications and are intended to improve long-term conditions.

All Alternatives (1-4): Under all alternatives, carp removal would continue, although carp removal under the action alternatives would potentially be more robust than current carp removal strategies. Because carp uproot and eliminate submerged vegetation, increase turbidity, and decrease the overall abundance and diversity of the invertebrate community (Miller and Crowl 2006), the removal of carp under all alternatives is expected to improve the quality of the habitat, water quality, and survivability of fish eggs and fingerlings. Increased survival of fish would result in a greater food

source for Refuge wildlife. Under all alternatives, staff would also work with partners to find additional ways to improve water quality. Improving water quality would be beneficial for emergent beds and their associated wildlife. The presence of humans performing monitoring activities would likely cause a short-term negative impact, but the ability to improve water quality would provide a far greater positive impact. There would be an increase in research, inventory, and monitoring under all alternatives with the greatest increases realized in the action alternatives. Increases in research, inventory, and monitoring may cause some short-term negative impacts, but the knowledge gained from the studies would improve the management of the emergent beds and their associated wildlife in the future.

Alternative 1: Other than those common effects listed in Section 6.2, there would be no change in habitat and wildlife management under this alternative. The invasive species control programs would continue to opportunistically treat invasive species as they are located if time and resources permit and minimally apply the concepts of IPM. New infestations of purple loosestrife and other aquatic invasive species may be left untreated, leading to more and more habitat being taken over by these undesirable species. The lack of desirable species, like smartweed, would reduce food sources available to waterfowl and other wildlife and may cause them to seek feeding habitat elsewhere. If the food source is greatly compromised, breeding species may be forced to leave Lake Lowell. A reduction in desirable plants like smartweed might also make it more difficult for wildlife to find suitable nesting material if the infestation of undesirable vegetation is extensive, resulting in significant long-term negative impacts for these species.

Action Alternatives (2-4): These alternatives propose to increase access to open water from emergent beds by opening channels in the emergent beds. These channels would positively impact nesting grebes and waterfowl by providing easy access to open water feeding areas from more densely vegetated nesting areas. Increased and targeted reduction of invasive species in the action alternatives would create a more diverse assemblage of native and desirable plant species.

Alternatives 2 through 4 also include various methods of mapping, monitoring, and controlling invasive species on the Refuge that would follow the IPM Plan (Appendix G). Control measures include biological, chemical, and mechanical methods in keeping with Service policy. Impacts from invasive vegetation management can vary depending on size, timing, and location of control. Impacts to nontargeted vegetation from the use of equipment and herbicide overspray, as well as impacts to habitat and wildlife from human presence during treatment, can all create potential negative effects. These effects are considered temporary and would be negligible especially when considering the long-term positive effects of wildlife habitat free of invasive species' infestation. Invasive species reduction in emergent beds is expected to benefit waterbirds, waterfowl, and fish.

Increases in research, inventory, and monitoring in Alternatives 2 through 4 would be above and beyond those identified in Alternative 1 and may cause some short-term negative impacts. However, the knowledge gained from the studies would improve management of the emergent beds and their associated wildlife in the future.

The Refuge has identified an optimal water level for the emergent beds in the action alternatives. If the Board of Control is able to accommodate these levels while still meeting its irrigation purpose, there would be a significant positive effect on the emergent beds and the wildlife that use them. Nesting grebes and other on-water nesting birds would benefit the most from emergent beds that stay inundated throughout the spring and summer.

6.4.2.2 Effects of Public Use and Public Use Management

Using the general effects and response of wildlife and habitat to human disturbance described in Section 6.4.1.2, as well as knowledge of Refuge-specific species, the following effects could be seen versus the current state.

Alternative 1: The amount of human activity that occurs in the emergent beds near Lake Lowell's shores is not fully known. In a 2011 USGS lake use study (Appendix L), less than 20 percent of users were active in the emergent beds or on the edge of emergent beds. These users were typically anglers fishing from boats. Three factors would lead to an intermediate to significant long-term negative impact to wildlife from human disturbance from this alternative. First, wildlife in and adjacent to these areas are highly susceptible to disturbance. Second, there would be virtually no change to public use regulations on the Refuge. And, third, public use is estimated to increase over time. Under alternative 1, 0 acres of emergent beds would be protected from all uses, and 280 acres would be buffered from high-speed boating by no-wake zones.

Increased public use in the emergent beds is likely to negatively impact Clark's and western grebes that nest there. Because the breeding population of Clark's and western grebes is listed as imperiled by the State of Idaho (IDFG 2005), any potential negative impact to their nesting habitat should be seen as significant. Species are designated imperiled in Idaho if few populations exist, there is a rapid decline in numbers, or other factors make the species vulnerable to range wide extinction or extirpation (IDFG 2005). The western grebe is also a candidate species for listing as threatened or endangered in Washington State, and Clark's grebes are a species of concern in Arizona, Montana, and Wyoming (Ivey 2004). In Canada, the western grebe is considered a sensitive species in Alberta (Hanus et al. 2002; Yanch 2006) and is on British Columbia's provincial Red List (i.e., candidates for endangered or threatened status) because of population declines, few active breeding sites, and the vulnerability of those sites to habitat erosion and human disturbance (Burger 1997).

High-speed boat wakes have the ability to tip or flood grebe nests, causing abandonment (Burger 1997). The effects of human disturbance to wildlife populations is discussed throughout this document, and the proximity of humans to grebe nests, especially for long durations of time, or at high-speeds, could also cause nest or colony abandonment. Under the status quo alternative, public uses are allowed in the emergent beds, even where nesting is occurring. Public use of these areas is likely to increase over time.

Shorebirds would be negatively affected by increased visitation under Alternative 1 in much the same way as discussed above (Section 6.4.1.2). The disturbance to shorebirds would be even greater given the proximity of the emergent habitats to the mudflats used by shorebirds.

The effects of increasing visitation would also negatively affect nesting and feeding waterfowl. Disturbance can reduce courtship behavior and decrease egg and duckling survival. Disturbed adults may leave their eggs, nestlings, or ducklings, thus reducing survival rates (Korschgen and Dahlgren 1992). Dabbling ducks use the emergent zone for feeding. Disturbance of these areas could result in the use of less suitable feeding areas or the need to locate feeding areas off-refuge. Smartweed is an especially good source of food for waterfowl, with ducks using the seeds, plant, and invertebrates that live among the smartweed. Public use programs can affect waterfowl either through direct alteration of habitat (facility construction), physical alteration from off-trail use, and disturbance effects associated with visitors in close proximity to nesting, feeding, and roosting waterfowl. The physical impact of public use activities depends upon the size of the group(s), season of use, and

activity's location and duration. The construction and maintenance of visitor use facilities (i.e., trails, pullouts, and photography blinds) could have effects on soils, vegetation, and possibly hydrology in specific areas. This could potentially increase erosion and cause localized soil compaction (Liddle 1975); reduced seed emergence (Cole and Landres 1995); alteration of vegetative structure and composition; and sediment loading (Cole and Marion 1988).

Alternative 2: Identifying buffer distances for nesting waterbird colonies, shorebird feeding areas, and other sensitive wildlife species would allow the Refuge to implement seasonal closures to reduce human disturbance in these areas. Reduction of human disturbance should lessen human-caused nest abandonment, increase the amount of time spent on nests by adults, and reduce human-caused flushing events. Providing no-wake zones adjacent to shore and areas of highest wildlife use would lessen the impacts of wake and speed on wildlife. A no-wake zone would also reduce public use to those visitors willing to travel approximately five miles per hour or slower. Grebes and other on-water nesting birds that nest in the no-wake and seasonally closed areas would be expected to experience fewer instances of nesting disturbance due to boat wakes. The reduction in human use in the no-wake zones and seasonally closed areas would also be expected to lower the instances of flushing from feeding and nesting areas for a variety of wildlife species (e.g., eagles, herons, grebes, shorebirds, waterfowl). The three docks proposed in Alternative 2 could impact between 1,050 and 2,400 square feet of emergent-bed habitat depending on the size of the docks. Given that these docks are proposed for areas outside of known nesting colonies, their impact should be minimal. In this alternative, a varied number of acres of emergent beds would be protected from all uses because of dynamic seasonal bird closures, and 700 acres would be buffered from high-speed boating by no-wake zones.

Alternative 3: Initiating closures of the southeast end of the lake as well as emergent beds between Parking Lots 3 and 8 and in Murphy's Neck would provide habitat for resting, feeding, and nesting waterbirds protected from human disturbance. These closures would allow undisturbed use of areas only protected by no-wake zones in Alternative 2. Nesting colonies may grow throughout the season as birds forced to abandon nests create a second nesting site or as late-arriving birds select nesting sites. This alternative may provide more protection for these types of nesters because their nests may be outside of the boundaries of the seasonal nesting closures created in Alternative 2. There would be an overall reduction in disturbance to emergent beds and the wildlife that use them. Providing large swaths of closed emergent beds would make it easier for birds to find food for themselves and their chicks adjacent to nesting sites. The four docks that are proposed under this alternative could impact between 1,400 and 3,200 square feet of emergent-bed area, depending on the size of the docks. Given that these docks are proposed for areas outside of known nesting colonies, their impact should be minimal. In this alternative, 680 acres of emergent beds would be protected from all uses because of closed areas, and 210 acres would be buffered from high-speed boating by no-wake zones.

Alternative 4: The removal of wake-causing activities in Alternative 4, coupled with the closure of all emergent beds and the southeast end of the lake, would provide the greatest reduction in damage from wakes and flushing and abandonment caused by human disturbance. This reduction would have significant positive benefit for waterbirds, shorebirds, waterfowl, and other wildlife that use the emergent beds. This alternative would provide an even larger area free from human disturbance to food sources, making it easier for birds to find food for themselves and their chicks adjacent to nesting sites. Removal of high-speed boaters from the lake would most likely reduce the overall use of the lake by boaters, further reducing human disturbance to wildlife. The two docks that are proposed under this alternative could impact between 700 and 1,600 square feet of emergent-bed area, depending on the size of the docks. Given that these docks are proposed for areas outside of

known nesting colonies, their impact would be minimal. In this alternative, 870 acres of emergent beds would be protected from all uses because of closed areas, and 40 acres would be buffered from high-speed boating by no-wake zones.

6.4.2.3 Overall Effects

The majority of effects to wildlife that use emergent-bed habitat associated with the Refuge would be positive under the three action alternatives. By design, these alternatives seek to deviate from the status quo in order to provide adequate space in emergent-bed habitat. Protection measures proposed in the action alternatives would result in positive cumulative effects for fish and wildlife that use these habitats. The continued growth of visitation without increased public use management would lead to a significant negative effect to emergent beds and wildlife species that use them for feeding, resting, nesting, and rearing under Alternative 1. Alternative 2 would provide a minor long-term positive effect by providing no-wake zones adjacent to shore areas of highest wildlife use and seasonal closures around nesting waterbirds and feeding shorebirds. Alternative 3 would provide intermediate long-term positive effects due to closures of the southeast end of the lake as well as emergent beds between Parking Lots 3 and 8 and in Murphy's Neck and by implementing no-wake zones adjacent to most of these closures. Alternative 4 would provide significant long-term positive effects from removal of wake-causing activities, coupled with the closure of all emergent beds and the southeast end of the lake.

6.4.3 Effects to Riparian Habitat and Associated Species

Riparian habitat refers to the interface between the upland areas and wetland areas of the Refuge. The riparian zone is characterized by hydric soils that support a vegetative community dominated by water-dependent plants. There are approximately 1,900 acres of riparian habitat on the Lake Lowell Unit and 630 acres on the Snake River Islands Unit. The total number of acres for both Refuge units fluctuates depending on precipitation, water use, and flow regimes. Although Lake Lowell is not a natural lake and requires human manipulation to maintain, the riparian habitat created by the reservoir is especially important to local and migratory wildlife looking for suitable habitat in the highly degraded Columbia Basin and shrub-steppe desert. One study has shown that some riparian areas harbor up to 10 times the number of neotropical migrants than do neighboring nonriparian habitats (Stevens et al. 1977). Of the 243 bird species breeding in Idaho, 113 (46%) use riparian habitat for nesting habitat. Many of the other 130 species also use riparian habitat as a source of water, migratory corridors, or for other purposes. Of the 119 neotropical migratory landbirds, 68 (57%) use riparian habitat. Many of Idaho's mammals, amphibians, reptiles, fish, and mollusks also depend on riparian habitat for survival (Idaho Bird Conservation Plan 2000).

Alternative 1: Under the status quo alternative, riparian habitat would continue to be subjected to a variety of impacts stemming from human use and presence. The closure for the nesting eagle in the North Side Recreation Area would continue to be the only riparian closure specific to nesting wildlife.

Alternative 2: The Preferred Alternative would have minor long-term positive effects to riparian habitat relative to the current condition, by implementing strategic seasonal closures that would surround active nesting areas, thereby reducing human presence during sensitive periods. Space within these closures would provide intact riparian habitat with reduced or no human intrusion.

Alternative 3: This alternative would provide minor long-term positive effects to additional riparian habitat acres permanently closed (outside of the hunt season) to provide for riparian-dependent species. Wildlife and nonwildlife-dependent recreation would be restricted to portions of the Refuge that would likely have fewer negative impacts to wildlife using riparian habitat.

Alternative 4: Riparian protections in this alternative would be similar to Alternative 3. However, human activity under Alternative 4 would be restricted to only wildlife-dependent recreation, which would reduce disturbance and provide an intermediate, long-term positive effect on riparian habitats and the wildlife using them.

6.4.3.1 Effects of Habitat and Wildlife Management Actions

Alternative 1: Invasive species would continue to be removed on an opportunistic basis with no plan or strategy in place to direct or prioritize areas in need of treatment. New infestations of tamarisk, white bryony, poison hemlock, and other undesirable species may be left untreated, leading to more and more habitat being taken over by these undesirable species. The lack of desirable species, like cottonwood and willow, would reduce the attractiveness of the Refuge riparian area to nesting and migrating birds such as neotropical migrants, bald eagles, herons, and cormorants. Under this alternative, fire management would continue to focus on the current firebreaks and minimal removal of undesired vegetation. As dead and downed trees, rank vegetation, and ladder fuels continue to accumulate, the possibility of a catastrophic fire increases. If the growth of undesirable vegetation and increase in large fires is extensive, the loss of healthy riparian habitat from the Refuge could cause dramatic negative effects, because intact riparian habitat is so important.

Action Alternatives (2-4): Alternatives 2 through 4 also include various methods of mapping, monitoring, and controlling invasive species on the Refuge that would follow the IPM Plan (Appendix G). Control measures include biological, chemical, and mechanical methods in keeping with Service policy. Impacts from invasive vegetation management can vary depending on size, timing, and location of control. Impacts to nontargeted vegetation from the use of equipment and from herbicide overspray, as well as impacts to habitat and wildlife from human presence during treatment, can all create potential negative effects. These effects are considered temporary and would be negligible, especially when considering the long-term positive effects of wildlife habitat free from invasive species' infestation. Invasive species reduction in riparian habitat is expected to benefit a wide variety of Refuge wildlife.

Removal of unwanted invasive or noninvasive vegetation through the use of controlled burning and mechanical techniques is expected to increase the health of the riparian areas by allowing new growth and reducing the chances of a large catastrophic wildfire. Although vegetation removal would have temporary negative impacts to wildlife species, the increase of overall health in the managed area would be a long-term positive benefit for the habitat and wildlife. For example, in order to create an opening in a riparian forest to increase edge effect (attractive to many species of wildlife due to the variance in habitat condition), some portions of vegetation would be removed mechanically. It is highly likely that some passerine birds would be displaced as perches, nesting sites, and territories are removed.

Under the action alternatives, the removal of undesirable, nonnative animals (e.g., feral cats and dogs) from the Refuge is proposed. Removal of these animals would reduce predation on native wildlife, and reduce the possibility of domestic animals spreading disease to wildlife. Removal would reduce the amount of predation on passerine bird species, small mammals, and reptiles, the amount

of wildlife disturbance, and the possibility of disease transmission, thus benefiting a variety of wildlife species.

Increases in research, inventory, and monitoring would be greater than those identified in Alternative 1 and may cause some short-term negative impacts. However, the knowledge gained from the studies would improve the management of the riparian areas and their associated wildlife in the future.

6.4.3.2 Effects of Public Use and Public Use Management

Using the general effects and responses of wildlife and habitat to human disturbance described in Section 6.4.1.2, as well as knowledge of Refuge-specific species, the following effects could be seen versus the current state.

A new Lake Lowell Unit deer hunt was recently implemented under a different planning process (USFWS 2011a) and began in Fall 2012. The majority of this new hunt takes place in the riparian area on the south side of the Lake Lowell Unit, and the effects of this hunt on wildlife and habitat are discussed as part of that environmental assessment (EA) (USFWS 2011a). None of the alternatives propose to make changes to this new hunt.

Historically, deer hunting has been allowed on the Snake River Islands Unit. None of the alternatives propose to make changes to this hunt. In general, deer hunting (along with its management) on the Refuge involves human presence in riparian habitat, which may result in impacts. In areas open to public use, social trails fragment viable wildlife habitat and increase user impact on the natural system. Wildlife (both deer and other nontarget species) typically respond to recreationists by flushing away from the perceived danger, which effectively reduces the amount of suitable habitat available to them (Taylor and Knight 2003). Frequent flushing of an animal increases the amount of expended energy, which reduces their overall growth and reproductive potential, and causes animals to avoid otherwise suitable habitat (Geist 1978).

Alternative 1: Under the status quo alternative, riparian habitat would continue to be subjected to a variety of impacts stemming from human use and presence. The enforcement of on-trail-only recreation could have a long-term positive effect by reducing impacts from off-trail travel. Currently, this Refuge regulation is not well known or enforced, even though the last compatibility determination for walking and jogging stated on-trail use only as a stipulation. There would be no new closures to protect wildlife nesting or wintering adjacent to highly used public trails. If the 1994 compatibility determinations for upland uses were regulated, there could be a benefit to wildlife over the current state by ensuring that all upland users (aside from hunters) stay on designated trails. Overall, however, there would be minor long-term negative impacts due to the projected increase in Refuge users under this alternative if on-trail regulations are not renewed or enforced.

Alternative 2: Off-trail recreational use by wildlife-dependent users would be allowed all year in the East Side Recreation Area. All visitors would be required to stay on-trail from February 1 through July 31 in the North Side and South Side Recreation Areas and at Murphy's Neck to protect breeding and nesting birds, such as bald eagles, red-tailed hawks, great blue herons, grebes, egrets, cormorants, and others. The access point to Murphy's Neck may be moved to the Lower Dam Recreation Area (LDRA) if a fully ADA-accessible trail from the LDRA through the riparian area to Murphy's Neck is installed. This trail may have minor negative effects on the wildlife using the immediately adjacent riparian area. Expansion of on-water, no-wake, and seasonally closed areas is expected to have a long-term positive effect on wildlife using the riparian areas adjacent to them.

Wildlife, like nesting herons and bald eagles, are expected to benefit from these changes through a decrease of human-caused disturbance. Allowing nonwildlife-dependent visitors to use only the Observation Hill Trail, Kingfisher Trail, and East Dike Trail, and not allowing any nonwildlife-dependent group activities, would lessen wildlife impacts on these trails and elsewhere on the Refuge.

Alternative 3: Under this alternative, a two-mile long boardwalk is proposed for construction between Parking Lots 1 and 3. This would result in disruption to approximately two acres of riparian habitat that currently has minimal visitor use outside hunting season. The boardwalk construction may reduce the positive effects of the other public use management strategies.

Alternatives 3 and 4: These alternatives propose that only wildlife-dependent activities be allowed in the uplands and that all upland use (except for hunting) occur on maintained roads and trails. The combination of fewer visitors using the uplands (because there would be no nonwildlife-dependent activities allowed), and keeping them on roads and trails would greatly reduce human disturbance to wildlife in the riparian areas versus the current state. The uses that are likely to occur are also more likely to be slower (i.e., no jogging) and less disturbing (i.e., no dogs) than current activities. The reduction of high-speed boating in Alternative 3, and the removal of high-speed boating in Alternative 4, along with the removal of boating activities near the majority of the shoreline, is expected to benefit wildlife using riparian areas adjacent to the lakeshore (e.g., nesting herons and eagles) through a reduction in noise and human proximity to nesting wildlife.

6.4.3.3 Overall Effects

Some of the negative effects of increased visitation in Alternative 1 could be countered by enforcing the 1994 compatibility determination for upland uses. However, if current enforcement levels are continued, this alternative would have a minor long-term negative impact versus the current condition due to projected increased visitation. Under Alternative 2, wildlife is protected through the use of on-trail-only requirements during months when wildlife is most vulnerable. Allowing nonwildlife-dependent users to use only the Observation Hill Trail, Kingfisher Trail, and East Dike Trail would lessen the impacts to wildlife elsewhere on the Refuge. Not allowing competitive, land-based nonwildlife-dependent group activities on the Refuge under all action alternatives would positively impact wildlife adjacent to trails. Increases in public use may reduce some of the positive effects seen in these alternatives over the current state. The reduction in or complete removal of nonwildlife-dependent uses in Alternatives 3 and 4 is expected to positively impact the Refuge's wildlife by reducing fast-paced activities, human interactions, and noise associated with group and nonwildlife-dependent uses. A public use decrease is also expected under Alternative 4, thereby decreasing human-caused wildlife disturbance. The modest increase in public use under Alternative 3 is not expected to counter the positive effects created by the proposed actions. However, the boardwalk proposed under Alternative 3 would cause direct impacts to riparian resources on the south side of the lake. Alternative 4 would have the most positive effects to wildlife and riparian habitat with no nonwildlife-dependent uses being allowed and a reduction in future visitation over the current state. Taking into consideration all impacts, the changes to public use management in Alternatives 2 and 3 would lead to minor long-term positive effects to riparian habitat and wildlife species. Changes under Alternative 4 would lead to an intermediate long-term positive effect.

6.4.4 Effects to Shrub-steppe Habitat and Associated Species

Shrub-steppe refers to the upland areas above the influence of the wetland zones around the Refuge. The shrub-steppe habitat is characterized by dry soils that are exploited by mostly nonnative vegetation. Native vegetation that does exist is dominated by sagebrush, four-winged saltbush, and various grasses. Even though most of the vegetation is nonnative, these areas provide nesting and foraging habitat for ground-nesting birds, resting and feeding areas for flocks of geese, foraging space for raptors, and habitat for small mammals and other wildlife (e.g., northern harriers, mule deer, badgers, gopher snakes). There are approximately 830 acres of shrub-steppe habitat on the Lake Lowell Unit and 550 acres on the Snake River Islands Unit. Uplands on the Refuge typically consist of patches of big sagebrush with a cheatgrass understory between Lake Lowell, agricultural fields, fences, roads, and irrigation dikes. Uplands on the Snake River Islands typically occur in the middle of the islands and are often surrounded by a circle of riparian vegetation. The shrub-steppe habitat on the Refuge is highly fragmented; the area near the Visitor Center has the largest contiguous piece (550 acres).

Sagebrush shrub-steppe ecosystems and the wildlife that depend on them are thought to be among the most imperiled in North America (Dobkin and Sauder 2004; Knick et al. 2003; Knick and Rotenberry 2002; Mac et al. 1998). Populations of shrubland and grassland birds, which represent an important component of the western United States' biodiversity, are declining more rapidly than other groups in North America (Dobkin 1994; Knopf 1994; Saab and Rich 1997; Vickery and Herkert 1999). Declines in sagebrush-dependent species can be attributed to the once-greater than 60 million hectares of the Intermountain West shrub-steppe habitat being degraded, fragmented, converted to agriculture, or changed to vegetative states dominated by exotic annual grasses (Miller and Eddleman 2001; West 1996). These disturbance regimes have accelerated soil erosion and sagebrush ecosystem losses (Bunting et al. 2003; West and Young 2000) to a point where the ecological integrity may be pushed beyond a threshold from which they can recover (Allen 1988; Belnap and Eldridge 2001). Large-scale conservation and restoration of sagebrush lands are becoming high priorities for natural resource agencies because of declines in populations of widely distributed species such as sage-grouse (BLM 2002).

Alternative 1: Under the status quo alternative, shrub-steppe habitat would continue to be subjected to a variety of impacts stemming from human use and presence. Wildlife species that rely on this habitat would be expected to endure additional human-caused disturbance because of the projected increase in visitation.

Alternative 2: The Preferred Alternative would offer additional protections in shrub-steppe habitat by implementing seasonal on-trail regulations that would surround active nesting areas, thereby reducing human presence during sensitive periods. Space within these closures would provide intact shrub-steppe habitat with reduced or no human intrusion.

Alternative 3: On-trail use requirements and fewer nonwildlife-dependent activities would provide additional shrub-steppe habitat protections. A small projected reduction in Refuge visitation would also be expected to result in a decrease in human-caused wildlife disturbance.

Alternative 4: Alternative 4 would offer the most protections for sage-steppe habitat and associated wildlife. The projected reduction in visitation and allowing only on-trail, wildlife-dependent uses would be expected to greatly reduce human-caused impacts to wildlife.

6.4.4.1 Effects of Habitat and Wildlife Management Actions

Management actions proposed as part of this plan are intended to provide long-term positive effects to shrub-steppe habitat and associated wildlife. The action alternatives propose strategies that would improve the quality of shrub-steppe habitat by reducing the amount of invasive species, most notably cheatgrass, and creating a diverse assemblage of native grasses to improve fuel levels and reduce chances of destructive fires. Many of these management actions would have short-term or temporary negative impacts to wildlife. For example, a controlled burn, to reduce the amount of cheatgrass duff and help establish a native grass understory, would likely displace wildlife in the immediate area. However, the cheatgrass reduction would provide a long-term positive benefit.

Alternative 1: Invasive species would continue to be removed on an opportunistic basis with no plan or strategy in place to direct or prioritize areas in need of treatment. New infestations of cheatgrass, poison hemlock, white bryony, tamarisk, whitetop, and other undesirable species may be left untreated, leading to more and more habitat being taken over by them. The lack of desirable species, such as native bunchgrasses, wheatgrass, and Idaho fescue, would reduce the attractiveness of the Refuge shrub-steppe habitat to nesting and migrating birds (i.e., burrowing owls, western meadowlarks, and Savannah sparrows). Fire management would continue to focus on the current firebreaks and minimal removal of undesired vegetation. As cheatgrass continues to accumulate, the possibility of a widespread catastrophic fire increases. If the growth of undesirable vegetation and increase in large fires is extensive, the loss of healthy shrub-steppe habitat from the Refuge would negatively impact species that rely on such habitat.

Action Alternatives (2-4): Alternatives 2 through 4 also include various methods of mapping, monitoring, and controlling invasive species on the Refuge by use of the IPM Plan (Appendix G). Control measures include biological, chemical, and mechanical methods in keeping with Service policy. Impacts from invasive vegetation management can vary depending on size, timing, and location of control. Impacts to nontargeted vegetation from the use of equipment and from herbicide overspray, as well as impacts to habitat and wildlife from human presence during treatment, can all create potential negative effects. These effects are considered temporary and would be negligible especially when considering the long-term positive effects of wildlife habitat free from invasive species' infestations. Invasive species reduction in shrub-steppe habitat is expected to benefit a wide variety of plants and wildlife.

Removal of unwanted invasive or noninvasive vegetation through the use of controlled burning and mechanical techniques is expected to increase the health of the shrub-steppe areas by allowing growth of native plants like Wyoming big sagebrush, bluebunch wheatgrass, and Idaho fescue, and reducing the chances of a large catastrophic wildfire. Although these removal methods would have temporary negative impacts to wildlife, the increase of the managed area's overall health would be a long-term positive benefit.

Under the action alternatives, the removal of undesirable, nonnative animals (e.g., feral cats and dogs) is proposed. These removals would reduce predation on native wildlife, and reduce the possibility of domestic animals spreading disease to Refuge wildlife. Removal of feral cats would reduce the predation amounts on passerine bird species, small mammals, and reptiles. Removal of cats and dogs would also reduce the amount of wildlife disturbance and possibility of disease transmission, benefiting a wide variety of wildlife.

Removing unnecessary internal firebreaks within the Refuge's shrub-steppe habitat would reduce habitat fragmentation. This action would also reduce the number of firebreaks requiring maintenance, thereby leaving more time for other management activities.

Increases in research, inventory, and monitoring would be greater than those identified in Alternative 1 and may cause some short-term negative impacts. However, the knowledge gained from the studies would improve future management of the shrub-steppe habitat and its associated wildlife (e.g., a study to determine the best cheatgrass removal techniques could make restoration of native habitats more cost effective and efficient, leading to more restored acres).

6.4.4.2 Effects of Public Use and Public Use Management

Using the general effects and responses of wildlife and habitat to human disturbance described in Section 6.4.1.2, as well as knowledge of Refuge-specific species, the following effects could be seen versus the current state.

Deer hunting would take place on a small amount of upland habitat on both units of the Refuge. These hunts are more associated with riparian habitat, as discussed above. Additional effects in upland habitat are expected to be minimal and similar to those discussed in the riparian section.

Alternative 1: Under the status quo alternative, shrub-steppe habitat would continue to be subjected to a variety of impacts stemming from human use and presence. Compatibility determinations for upland uses (1994) required them to be on-trail only. Enforcement of the on-trail-only regulation could have a positive long-term effect by reducing impacts from off-trail travel. Currently, this regulation is not well known or enforced. There would be no additional closures to protect wildlife nesting or wintering areas adjacent to highly used trails. If the upland compatibility determinations were enforced, there could be a benefit to wildlife over the current state by ensuring that all upland users (aside from hunters during hunting season) stay on designated trails. There would, however, be negative impacts due to the projected increase in Refuge users under this alternative.

Action Alternatives (2-4): Creation of an additional trail on the Observation Hill Trail System is expected to reduce trespass on its seasonally closed portion.

Alternative 2: Off-trail recreational use by wildlife-dependent users would be allowed all year in the East Side Recreation Area. All visitors would be required to stay on-trail from February 1 through July 31 in the North and South Side Recreation Areas to protect breeding and nesting birds (quail, killdeer, kingbirds, horned larks, and sage thrashers). Modifying the current firebreak from the Refuge's entrance parking lot to the observation platform may increase trail usage and human disturbance to wildlife in the vicinity. Under Alternative 2, the construction of new facilities would be expected to result in loss of shrub-steppe acreage with the amount depending on how the visitor contact station is constructed: approximately four acres if a new one is built and 2.9 acres if the existing Environmental Education Building is converted. Some of the new facilities would be installed at the Lower Dam Recreation Area, most of which has already been converted to manicured lawn. Approximately two acres of more natural habitat would also be disturbed.

Alternative 3: Horseback riding, dog walking, and nonwildlife-dependent group activities would not be allowed, and all users would be required to stay on-trail at all times. These changes from the current state would be expected to have an intermediate long-term positive impact on sagebrush-steppe wildlife through noise reduction, pet- and human-caused wildlife disturbance, unpredictability

of visitor travel, soil and vegetation compaction, and a modest increase in overall visitation. Under Alternative 3, the construction of new facilities would be expected to result in loss of shrub-steppe acreage, with the amount depending on how the visitor contact station is constructed: approximately 3.7 acres if a new one is built and 2.6 acres if the existing Environmental Education Building is converted. Approximately 1.8 acres would be disturbed outside of the Lower Dam Recreation Area.

Alternative 4: This alternative would have the greatest long-term positive impacts to wildlife and habitats because only on-trail wildlife-dependent activities would be permitted, with a projected reduction of overall visitation. These changes from the current state would be expected to have a long-term positive impact on sagebrush-steppe wildlife through noise reduction, speed of visitor travel, unpredictability of visitor travel, pet- and human-caused wildlife disturbance, and soil and vegetation compaction. Under Alternative 4, the construction of new facilities would be expected to result in loss of shrub-steppe acreage, with the amount depending on how the visitor contact station is constructed: approximately 1.9 acres if a new one is built and 0.7 acre if the existing Environmental Education Building is converted. Approximately one-half acre would be disturbed outside of the Lower Dam Recreation Area.

6.4.4.3 Overall Effects

All alternatives have the potential of some positive effect on shrub-steppe habitats and associated wildlife. The negative impact of increased visitation in Alternative 1 would reduce any positive effects that could be seen from enforcement of on-trail regulations. If on-trail regulations are not renewed or enforced, the increase in visitation would create a minor long-term negative effect on all 830 acres of shrub-steppe habitat. Although Alternative 2 does not restrict use to trails year-round, the seasonal trail use regulations, proposal to allow nonwildlife-dependent uses on designated trails only, and proposed habitat improvements are expected to provide an overall minor long-term positive effect on 520 acres of shrub-steppe habitat. Because Alternative 3 proposes to not allow nonwildlife-dependent group activities, dog walking, horseback riding, or off-trail use, along with only a small increase in overall visitation and proposed changes in habitat management, it is expected to have an overall intermediate long-term positive effect on 520 acres of shrub-steppe habitat. Because Alternative 4 proposes to allow only on-trail wildlife-dependent uses and improve habitat management, and would result in a decline in overall visitation, it is expected to have the least amount of negative impact, with an intermediate long-term positive effect on shrub-steppe habitat and associated wildlife on all 830 acres of shrub-steppe habitat.

6.4.5 Effects to Mudflats and Associated Species: Lake Lowell

According to the Manomet Center for Conservation Sciences, shorebird species have declined worldwide due, in part, to loss of habitat and human disturbance (Brown et al. 2001). Restoration, maintenance, and protection of habitat, especially mudflats, would be of great value to shorebird populations at the Refuge. Late in the summer, as Lake Lowell is drawn down for irrigation, numerous species of shorebirds use the exposed mudflats for feeding. Shorebirds depend upon wetland stopover sites to replenish depleted fat reserves used in their migratory flight (Dugan et al. 1981). Many wetland areas in Idaho and throughout the United States have been drained, developed, or otherwise altered, forcing shorebirds to use other remaining wetlands. Construction of reservoirs for power and irrigation across the United States has created about two million acres of such habitat since the mid-1950s (Howe 1987). Taylor and Trost (1992) showed that reservoirs in the western interior can be important migratory stopover sites for shorebirds. Chapter 4 of this document further

explores the importance of mudflats in the Intermountain West, Idaho, and Deer Flat Refuge. Management actions proposed as part of this CCP are intended to provide long-term positive effects to mudflats and associated wildlife. The action alternatives propose strategies that would improve the quality and quantity of this habitat by reducing the amount of recreational disturbance and encroachment of unwanted vegetation, as well as improving upon what exists now.

Alternative 1: There would be no change to the current state of habitat and wildlife or public use management. Refuge visitation is expected to increase. With no additional wildlife or habitat buffers being created, human-caused disturbance to feeding and resting shorebirds is expected to increase.

Alternative 2: Seasonal closure of highly used mudflats would provide protection for feeding and resting shorebirds against human-caused wildlife disturbance. Habitat management improvements to existing mudflats, such as vegetation discing and removal, shoreline scouring, and firewood collection, are also expected to enhance the existing habitat. These enhancements, along with vegetation removal to create more habitat in the West Pool, are expected to have intermediate, positive long-term effects on shorebirds.

Alternative 3: Seasonal closure of the mudflats in the West Pool and waters adjacent to them, along with a year-round closure adjacent to the mudflats in the lake's southeast end, would provide less-disturbed feeding and resting areas for shorebirds. Habitat management improvements to existing mudflats, such as vegetation discing and removal, shoreline scouring, and firewood collection, are also expected to enhance the existing habitat. These enhancements, along with vegetation removal to create more mudflats in the West Pool, are expected to have intermediate, positive long-term effects on shorebirds.

Alternative 4: The year-round closure of mudflats in the West Pool and waters adjacent to them, along with a year-round closure adjacent to the mudflats in the lake's southeast end, would provide less-disturbed feeding and resting areas for shorebirds. Habitat management improvements to existing mudflats, such as vegetation discing and removal, shoreline scouring, and firewood collection, are also expected to enhance the existing habitat. These enhancements, along with vegetation removal to create more mudflats in the West Pool, are expected to have intermediate, positive long-term effects on shorebirds.

6.4.5.1 Effects of Habitat and Wildlife Management Actions

Management actions proposed as part of this plan are intended to provide long-term positive effects to wildlife species including shorebirds. The action alternatives propose strategies that would improve shorebird habitat, namely the mudflats exposed in the fall as irrigation demands draw-down lake levels. These improvements would consist of creating additional mudflats with more predictable exposures and discing vegetation to incorporate organic matter into the soil and encourage invertebrate growth.

Alternative 1: There would be no changes to the management of the mudflats or the species associated with them.

All Action Alternatives (2-4): Changes to management of the mudflats, including vegetation removal and creation of shallow pools of water, are expected to create long-term positive impacts on the mudflats and associated species. Shorebirds, such as plovers, American avocets, western sandpipers, and marbled godwits, would benefit from the vegetation removal by having feeding areas

free from predator perches. They would also benefit from the shallow scours by having more food and shore edge available as the lake is drawn down. Because of fluctuating water levels and mudflat exposures, improvements can only be done when conditions are right for shorebirds to be present, thereby causing disturbance. Mitigation measures to avoid negative interaction would be used and habitat improvement activities are anticipated to be short-term, thus improving conditions in the long term. Any negative effects to shorebirds are expected to be negligible and far outweighed by intended positive effects.

6.4.5.2 Effects of Public Use and Public Use Management

Public use may affect shorebirds through disturbance effects associated with visitors in close proximity to feeding and resting areas. The scope of disturbance depends on public use activities, group sizes, season of use, and activity's location and duration. The construction and maintenance of visitor use facilities (in this case, an observation/photography blind in the Action Alternatives) could have effects on soils, vegetation, and possibly hydrology in a specific area. The construction, maintenance and use of this could potentially increase erosion, cause localized soil compaction (Liddle 1975); reduced seed emergence (Cole and Landres 1995), alter vegetative structure and composition; and cause sediment loading (Cole and Marion 1988) in the immediate area.

Mudflats used the most by shorebirds are near New York Canal at the lake's east end. The New York Canal is the southern boundary of the easterly end of the East Side Recreation Area. It is currently open to the public for numerous recreational activities including hunting and wildlife observation. Bird watchers walk in from Tio Lane to observe shorebirds in late summer and early fall and upland game hunters hunt mourning doves in dry smartweed beds adjacent to the mudflats. The consequences of human disturbance, in terms of physical condition or survival, are currently unknown (Fernández et al. 2010), but studies have shown that shorebirds avoid areas of higher disturbance. For example, when comparing bird response on paired lower and higher use days at trail sites, a study in California found the number of shorebirds decreased with increased trail use, with higher trail-use days averaging 25 percent fewer birds than lower use days (Trulio and Sokale 2008).

Using this information, the general effects on and responses of wildlife and habitat to human disturbance described in Section 6.4.1.2, as well as knowledge of Refuge-specific species, the following effects could be seen versus the current state.

Alternative 1: Because there are no proposed changes to public use management under Alternative 1 and Refuge visitation is expected to rise, human-caused disturbance to mudflats and their associated species is expected to increase over time, resulting in a long-term negative impact.

Alternative 2: Strategic seasonal closures surrounding mudflat areas used by feeding and resting shorebirds are expected to reduce human-caused disturbance. Fewer disturbances should lead to fewer instances of flushing and allow the shorebirds to feed more and create fuel reserves that would be used during migration. Shorebirds such as sandpipers, black-necked stilts, sanderlings, red knots, dowitchers, lesser yellowlegs, and long-billed curlews are expected to benefit from these changes.

Alternative 3: A seasonal closure of the entire West Pool mudflat and adjacent waters and a year-round closure that encompasses the mudflat in the lake's southeast end are expected to reduce human-caused disturbance even more than Alternative 2. Fewer disturbances should lead to fewer instances of flushing and allow the shorebirds to feed more and create fuel reserves that would be used during migration.

Alternative 4: A year-round closure of the entire West Pool mudflat and adjacent waters and one encompassing the mudflat in the lake's southeast end are expected to reduce human-caused disturbance even further than Alternative 3. Fewer disturbances should lead to fewer instances of flushing and allow the shorebirds to feed more and create fuel reserves that would be used during migration. Shorebirds such as sandpipers, black-necked stilts, sanderlings, red knots, dowitchers, lesser yellowlegs, and long-billed curlews are expected to benefit from these changes.

6.4.5.3 Overall Effects

With no change to the current state of habitat, wildlife, or public use management, and a projected increase in visitation, Alternative 1 is expected to have intermediate long-term negative effects on the mudflats and their associated wildlife. Alternatives 2 through 4 are all expected to have intermediate long-term positive impacts to Refuge mudflats through both habitat and public use management changes. Alternative 4 is expected to have the greatest positive impact on this habitat and its associated species.

6.4.6 Additional Effects to Waterfowl

6.4.6.1 Effects of Waterfowl Hunting on Local, Regional and Flyway Waterfowl Populations

Migratory game birds are those species designated in conventions between the United States and several foreign nations for protection and management. Under the Migratory Bird Treaty Act ([16 U.S.C. 703-712](#)), the Secretary of the Interior is authorized to determine when “hunting, taking, capture, killing, possession, sale, purchase, shipment, transportation, carriage, or export of any ... bird, or any part, nest, or egg” of migratory game birds can take place and to adopt regulations for this purpose. These regulations are written after giving due regard to “the zones of temperature and to the distribution, abundance, economic value, breeding habits, and times and lines of migratory flight of such birds” and updated annually ([16 U.S.C. 704\(a\)](#)). The responsibility for managing and conserving migratory birds in the United States was delegated to the Service.

Acknowledging regional differences in hunting conditions, the Service has administratively divided the nation into four flyways to manage migratory game birds: Atlantic, Mississippi, Central, and Pacific. Each flyway has its own council, a formal organization generally composed of one member from each state and province in that flyway. The Refuge is within the Pacific Flyway and allows hunting for ducks, geese (on the Snake River Islands Unit), and coots.

Because the Migratory Bird Treaty Act stipulates that all hunting seasons for migratory game birds are closed unless specifically opened by the Secretary of the Interior, the Service annually promulgates regulations ([50 C.F.R. 20](#)) establishing the frameworks from which states may select season dates, bag limits, shooting hours, and other options for each migratory bird hunting season. The Service annually prescribes frameworks, or outer limits, for dates and times when hunting may occur, and the number of birds that may be taken and possessed. These frameworks are necessary to allow states to select seasons and limits for recreation and sustenance; aid Federal, State, and Tribal governments in the management of migratory game birds; and permit harvests at levels compatible with population status and habitat conditions. The frameworks are essentially permissive, in that migratory bird hunting would not be allowed without them. Therefore, annual Federal regulations both allow and limit migratory bird hunting.

The process for adopting migratory game bird hunting regulations is constrained by three primary factors. Legal and administrative considerations dictate how long the rulemaking process lasts. Most importantly, however, the biological cycle of migratory game birds controls the timing of data-gathering activities and thus the dates on which these results are available for consideration and deliberation. The process of adopting migratory game bird hunting regulations includes two separate regulation development schedules, based on “early” and “late” hunting season regulations.

Early hunting seasons generally begin prior to October 1. Late hunting seasons generally start on or after October 1 and include most waterfowl seasons not already established. There are basically no differences in the processes for establishing either early or late hunting seasons. For each cycle, Service biologists and others gather, analyze, and interpret biological survey data and provide this information to all those involved in the process through a series of published status reports and presentations to Flyway Councils and other interested parties. Because the Service is required to take the abundance of migratory birds and other factors into consideration, it undertakes a number of surveys throughout the year in conjunction with the Canadian Wildlife Service, state and provincial wildlife-management agencies, and others. To determine the appropriate frameworks for each species, the Service considers factors such as population size and trend, geographical distribution, annual breeding effort, condition of breeding and wintering habitat, number of hunters, and anticipated harvest. After frameworks are established for season lengths, bag limits, and areas for hunting, migratory game bird management becomes a cooperative effort of Federal and State governments. After the Service establishes final frameworks for hunting seasons, the states may select season dates, bag limits, and other regulatory options for the hunting seasons. States may always be more conservative in their selections than the Federal frameworks but never more liberal. Season dates and bag limits for national wildlife refuges open to hunting, including Deer Flat, are never longer or larger than the State regulations.

The Service’s NEPA considerations for hunted migratory game bird species are addressed by the programmatic document Final Supplemental Environmental Impact Statement: Issuance of Annual Regulations Permitting the Sport Hunting of Migratory Birds (FSES 88-14), filed with the EPA on June 9, 1988. A Notice of Availability was published in the Federal Register on June 16, 1988 (53 FR 22582), and a Record of Decision signed on August 18, 1988 (53 FR 31341). Current year NEPA considerations for waterfowl hunting frameworks are covered under a separate Environmental Assessment—Duck Hunting Regulations for 2006-2007, and an August 24, 2006, Finding of No Significant Impact. Further, in a notice published in the September 8, 2005, Federal Register ([70 FR 53376](#)); the Service announced its intent to develop a new supplemental environmental impact statement for the migratory bird hunting program. Public scoping meetings were held in the spring of 2006, as announced in a March 9, 2006, Federal Register notice ([71 FR 12216](#)).

Waterfowl use in and around the Refuge has been well documented and seen some changes over time. Long-time residents fondly recall when the skies around Lake Lowell used to be black with ducks. Refuge annual narratives mirror these sentiments with photos and documentation of duck numbers in excess of half a million during the peak of migration. Those numbers have not been seen in the Treasure Valley since the late 1970s, probably due to the advent of “clean farming,” conversion of farmland to housing developments, natural shifts in the flyway, and/or a variety of other factors. Numbers of ducks and geese in the valley continue to provide a quality hunting experience and the Refuge is a waterfowl hunting destination for both local and out-of-state hunters.

Waterfowl hunting would essentially continue to occur as it is currently under all four alternatives. Small changes in the hunt areas in Alternatives 3 and 4 would likely have negligible impact on

waterfowl numbers on the Refuge. There may be a small increase in harvest numbers under the action alternatives, relative to the status quo, due to the likelihood of increased waterfowl use because of habitat improvements. Even though small changes in the management and enforcement of Refuge rules may slightly increase harvest numbers, it is expected to have negligible effect on regional waterfowl populations.

The Federal Harvest Information Program estimates that 16,800 hunters in Idaho spent 102,700 days hunting and harvested 225,100 ducks annually from 2001 through 2010. Over that same period, the harvest information program estimates Idaho hunters harvested 59,800 Canada geese annually. This is the third highest total in the Pacific Flyway, behind Oregon and Washington, respectively. The number of waterfowl harvested on the Refuge is unknown; however, it is thought to be a small percentage of total numbers harvested in the state and even smaller in the flyway.

Refuge personnel have performed winter waterfowl surveys since 1951. Because birds can move long distances over short periods of time during winter migration, these surveys are not considered an accurate measurement. Regional and local population surveys, like the one performed at Deer Flat, are best understood as an index (best used to measure trends over time) and not a true census at any particular time. For instance, Refuge waterfowl survey numbers (commonly between 300,000 and 500,000 ducks) for the late 1970s positively correlate with the anecdotal “skies were black with ducks” local sentiment. More recent and lower numbers (between 30,000 and 100,000) correlate with the frequently heard question “Where have all the ducks gone?”

6.4.6.2 Effects of Hunting on Waterfowl

Hunting, by its nature, results in the intentional take of individual animals, as well as wounding and disturbance (DeLong 2002). It can also alter behavior (e.g., foraging time), population structure, and wildlife distribution patterns (Bartelt 1987; Madsen 1995; Owens 1977; Raveling 1979; White-Robinson 1982). Waterfowl are wary, seeking refuge from all forms of disturbance, but particularly those associated with loud noise and rapid movement (Korschgen and Dolgren 1992). Numerous studies show human activities associated with hunting (boating, vehicle disturbance, human presence) cause increased flight time in waterfowl species, which requires a considerable amount of energy (Havera et al. 1992; Kahl 1991; Kenow et al. 2003; Knapton et al. 2000). Human disturbance compels waterfowl to change feeding habits like feeding only at night or deserting feeding areas entirely, resulting in weight loss (Korschgen and Dolgren 1992).

6.4.6.3 Effects of Waterfowl Hunting on Waterfowl Habitat Use

The effects of human presence in wildlife habitat were discussed in Section 6.4.1.2. The effect that hunting can have on distribution and habitat use by waterfowl has also been well studied. Belanger and Bedard (1995) concluded that disturbance caused by hunting can modify the distribution and use of various habitats by birds (Madsen 1995; Owens 1977). Another study that took place at Sacramento National Wildlife Refuge found statistically significant differences in the densities of northern pintails among hunting units, units adjacent to hunting units, units adjacent to the auto tour route, and units isolated from disturbance (Wolder 1993). Prior to the opening of hunting season, pintails had been fairly evenly distributed throughout usable habitat. Not surprisingly, after hunting season started, the pintails moved to more isolated wetlands and units closed to hunting and, therefore, removed from hunting pressure, indicating an avoidance of disturbed areas. Belanger and Bedard (1989) studied the effect of disturbances to staging greater snow geese in a Quebec bird sanctuary and found that disturbance to a flock of geese influenced goose use of the sanctuary on the

following day. When disturbance exceeded two events per hour, it produced a 50-percent drop in the mean number of geese present in the sanctuary the next day. These studies corroborate what is apparent at the Refuge during winter waterfowl surveys. Closed areas or sanctuaries (approximately 1,330 acres or 13 percent of Refuge lands) typically hold larger numbers of ducks and geese than areas that are open to public hunting.

Disturbance due to hunting may also cause waterfowl to alter feeding and resting routines resulting in decreased energy intake and increased energy expenditure. Wintering black ducks at Chincoteague NWR (Virginia) experienced reduced energy intake and doubled energy expenditure because of increased disturbance avoidance (Morton et al. 1989). Belanger and Bedard (1995) analyzed flushing responses and feeding habits of snow geese and found that high disturbance rates (more than two times per hour) limited the ability of the geese to adequately compensate for energy loss even with altered feeding regimes.

Hunters may also cause damage to the physical habitat that waterfowl rely upon. The primary impact is vegetation trampling and creation of social trails. Trail widening and social trails increase the area of disturbed land (Adkison and Jackson 1996; Dale and Weaver 1974; Liddle 1975). Pedestrians can potentially cause structural damage to plants and increase soil compaction and erosion (DeLuca et al. 1998; Whittaker 1978). These impacts are unlikely to occur on the well-defined, gravel surfaces of Refuge trails; however, social trails associated with off-trail use remain an issue for Refuge managers as plants are trampled and wildlife is disturbed. Because hunting requires off-trail use in the pursuit and/or recovery of game, this concern is difficult to mitigate.

Control of invasive plant species on the Refuge is a difficult and never-ending battle. Roads and trails often function as conduits for plant species' movement, including nonnative, invasive species (Benninger-Truax et al. 1992; Hansen and Clevenger 2005). Propagules of nonnative plants can be transported into new areas on hunters' boots, clothing, dogs, and equipment. There is the possibility that these transports could be new, nonnative plants not currently found at the Refuge or in a particular area. Once established, invasive plants can out-compete native plants, thereby altering habitats and indirectly impacting wildlife. Invasive plants would be controlled and monitored as part of the Refuge's IPM Plan (Appendix G).

6.4.6.4 Overall Effects

With regard to the effects on the Refuge's current harvest of waterfowl, the impacts of continuing the recreational hunting program would be negligible. Waterfowl harvest on the Refuge accounts for a small portion of the overall waterfowl numbers, based on mid-winter surveys at both the Pacific Flyway and State levels. Therefore, and in consideration of the regulatory harvest oversight conducted at the flyway level prior to each season, waterfowl hunting would not have a significant impact on local, regional, or Pacific Flyway waterfowl populations. Hunting can contribute to the well-being of wildlife by providing financial, educational, and sociological benefits to hunters, who are thereby committed to the availability of wildlife for their sport. Hunting has given many people a deeper appreciation of wildlife and a better understanding of the importance of wildlife and habitat conservation, which ultimately contributes to the NWRS mission. The hunting community has been among the largest support base for funding state wildlife management agencies (Heberlein 1991; Jahn and Trefethen 1978), and refuges provide an opportunity for a high-quality waterfowl hunting experience to all citizens regardless of economic standing. Many individual refuges have developed extensive public information and education programs that bring hunters into contact with Refuge activities and facilitate awareness of wildlife issues beyond hunting.

6.4.7 Effects to Threatened and Endangered Species

There are no listed or candidate species known to occur on the Refuge. There are various counties that surround both Refuge units with a variety of listed species historically or currently occurring within the county. Of these species, only the yellow-billed cuckoo has ever been documented on the Refuge; it is currently considered a vagrant as sightings are highly unusual. The Columbia spotted frog could conceivably exist on the Refuge but has not been documented. The habitat condition for both of these species is either unknown or marginal. The likelihood of any other listed species in the surrounding counties existing on the Refuge is slim. Most of these other species have known populations that occur off Refuge (e.g., Bruneau hot springs snail and Packard's milkvetch) or roam great distances and/or would not find suitable habitat on the Refuge (e.g., North American wolverine, greater sage-grouse). It is anticipated that impacts to listed or candidate species or their habitats from recreational uses would be negligible. If any use results in unacceptable adverse effects to listed or candidate species or habitats, the Refuge would impose restrictions to mitigate disturbance.

6.5 Effects to Public Uses

Welcoming visitors and providing opportunities for them to enjoy wildlife-dependent public uses is an important role of the Refuge System. This section includes assessment of the change in Refuge user numbers expected under each of the alternatives, how management actions under each alternative could affect quality opportunities for the Refuge System's priority (i.e., hunting, fishing, wildlife observation and photography, environmental education, and interpretation) and nonpriority (e.g., recreational boating, swimming, jogging, and horseback riding) public uses, as well as the amount of illegal uses and environmental justice considerations.

6.5.1 Estimating Annual Recreation Visits

Estimates of FY11 visitation, based on the sampling techniques described in Section 5.3.2, are provided in Table 6-2.

Table 6-2. Estimates of FY11 Visits to the Lake Lowell and Snake River Islands Units.*

Recreational Activity	Visits
Waterfowl hunting	5,100
Upland game hunting	1,100
Mourning dove hunting	100
Big game hunting	75
Shoreline or dock fishing	18,300
Boat fishing	27,000
Wildlife watching and photography	23,900
Environmental education	11,000
Interpretation (including Visitor Center)	21,000
Nonwildlife-dependent boating	49,400
Swimming and other beach activities	38,700
Walking and Jogging	16,500
Other Activities (e.g., picnicking)	11,300
Total	223,475

*Visitors may engage in more than one activity per visit. *Source:* 2011 Refuge Annual Performance Plan database.

6.5.2 Projected User Numbers in 15 Years

Refuge decisions about features of public use management—such as how many facilities to build, where to build them, how much staff time to devote to programs, and how much parking to provide—influence visitation for years to come. Similarly, and often playing a greater role, demographic shifts, cultural preferences, and economics influence Refuge visitation. Even small annual shifts can have a profound effect over time.

The CCP team projected the number of visits, by alternative, expected at the end of 15 years (Table 6-3). The population projections and outdoor recreation trend data and projections used in making those projections are summarized below.

The 2010 census showed a 21.1-percent increase in Idaho's population from 2000 through 2010, with population increases of 43.7 percent and 30.4 percent over the same period in Canyon and Ada counties, respectively (U.S. Census Bureau 2010). COMPASS (2010) projected a 3.6-percent average increase per year between 2010 and 2025 for Canyon County and 3.1-percent average increase per year for the region (i.e., Ada and Canyon counties) in the same time period. The growing state and regional populations, coupled with increasing interest in nature-based recreation and tourism within Idaho and nationally, would influence public uses at the Refuge under all management alternatives.

Many of the public use opportunities currently provided at the Refuge are very popular within Idaho and are projected to attract new participants in the coming years. IDPR began tracking outdoor recreation trends in 2002 in the first Idaho Statewide Comprehensive Outdoor Recreation and Tourism Plan (SCORTP) for 2003 through 2007 (IDPR 2003). Comparing the 2002 data with the most recent survey data from 2004-2005 (IDPR 2006), the data show substantial increases in a two-year period for the following activities: geocaching (154 percent), outdoor photography (44 percent), jet boating (30 percent), bird watching (29 percent), canoeing (26 percent), walking for exercise (22 percent), and watching wildlife other than fish (21 percent). The data also reveal a substantial decrease for running (26 percent).

IDPR (2010) reports boat license sales statewide. Given that about 95 percent of Lake Lowell Unit visitors are from within a 50-mile radius (Appendix L), the boat licensing data in neighboring counties (Ada, Canyon, Owyhee, and Payette counties) were used. Although the data are limited and shows fluctuations that cannot be interpreted easily, the data are reasonably well described with a logarithmic equation. This yields a 12-percent increase over baseline in projected boat licenses after 15 years. This is similar to a projection by Bowker et al. (1999) of a 1-percent constant annual growth rate in number of days involved in motorboating.

Hunting and fishing license data provided by Wiedmeier (pers. comm., 2011) show a small (0.46 percent) constant annual increase in hunting licenses sold statewide between 2005 and 2010. Fishing license sales show a more uneven trend, but, when analyzed, again show a small (0.46 percent) constant annual increase in fishing licenses.

Bowker et al. (1999) developed models to project future outdoor recreation participation to 2050 based on data from the National Survey on Recreation and the Environment (NSRE) conducted in 1995. The NSRE is the only ongoing assessment of national recreation trends. According to the Bowker report, fishing, hunting, wildlife watching and photography, hiking, walking, biking, horseback riding, picnicking and family gatherings, motorboating, and visiting beaches are projected

to increase at a rate higher than population growth within the Rocky Mountain region (including Idaho). Bowker et al. (1999) projected that nonpool swimming would increase at a rate that keeps pace with population growth.

Finally, Cordell (2008) describes general trends in nature-based recreation, comparing data from the NSRE completed between 1999 and 2001 to the survey completed between 2005 and 2008. Refuge activities that were among the fastest-growing nature-based outdoor activities from 2000 through 2007 included viewing and photographing nature, kayaking, visiting water, visiting nature centers, and big game hunting.

Table 6-3 displays visitation projections by use. The current number of Refuge visits is displayed, as well as the expected visits that would occur by the end of CCP implementation for each of the alternatives. Projected changes in visitation by use over the next 15 years for Alternative 1 were estimated using equations that fit observed trends described above, over a 15-year horizon. Visitation increases or decreases for the other alternatives by the end of 15 years were estimated based on the following considerations:

- Changes in recreational programs, facilities, and resources under each alternative (for more information on effects from proposed changes see Sections 6.5.3 through 6.5.12);
- Changes observed in visitation at the Refuge over the last 10 years (Refuge staff experience and best professional judgment); and
- Trend data described above.

Potentially contingent changes (e.g., restriction in upland game hunt hours based on results of visitor use surveys) are not reflected in these visitation projections.

Table 6-3. Deer Flat NWR's Current and Projected Annual Visits in 15 Years, by Alternative

Recreational Activity	Current Visits	Annual Visits at the End of 15 Years				Assumptions
	(2011)	Alt 1	Alt 2	Alt 3	Alt 4	
Waterfowl hunting	5,100	5,450	5,450	3,150	4,360	<i>Alt 1:</i> Assume linear trend line at 0.46% annual increase based on IDFG (pers. comm., C. Wiedmeier 2011) trend data. For deer hunting, assume all 45 tags in the new Lake Lowell controlled hunt would be filled each year. <i>Alt 2:</i> Same as Alternative 1 because no change in hunt area. <i>Alts 3 and 4:</i> For waterfowl, upland game, and mourning dove hunts, assume reduction proportional to reduced acreage available for hunting.
Upland game hunting	1,100	1,180	1,180	550	410	
Mourning dove hunting	100	110	110	50	40	
Big game hunting	75	125	125	125	125	
Fishing	45,300	48,430	48,430	23,260	12,710	<i>Alt 1:</i> Assume linear trend line at 0.46% annual increase based on Wiedmeier (pers. comm., 2011) trend data. <i>Alt 2:</i> Same as Alt 1, assuming minimal impact from more no-wake zones and of seasonal closures around wildlife nesting or feeding areas. <i>Alt 3:</i> Assume 60% reduction in fishing in the East Pool due to increased time to access fishing spots. Use USGS data (Appendix L) for

Recreational Activity	Current Visits	Annual Visits at the End of 15 Years				Assumptions
	(2011)	Alt 1	Alt 2	Alt 3	Alt 4	
						percentage of anglers who fish in emergent beds to determine displacement from emergent beds closed to fishing. <i>Alt 4</i> : Same assumptions as Alt 3 but 60% reduction for entire lake because all no wake.
Wildlife watching and photography	23,900	49,690	52,170	49,690	47,200	<i>Alt 1</i> : Assume 5% constant annual growth rate (compounded, exponential trend line) based on projections from Bowker et al. (1999) and Cordell (2008) for various wildlife viewing, photography, and nonconsumptive activities. <i>Alt 2</i> : Assume a 5% higher number of baseline visits from Alt 1 because of improved facilities. <i>Alt 3</i> : Assume same as Alt 1 because of restriction to on-trail travel balanced by improved facilities. <i>Alt 4</i> : Assume 5% lower number of baseline visits from Alt 1 because of restriction to on-trail travel and fewer improved facilities.
Environmental education	11,000	11,000	14,650	14,650	16,980	Current visits include Refuge programs, EE Building users, and traveling trunks. <i>Alt 1</i> : Assume remains the same because current staff are doing the maximum number of possible programs. <i>Alts 2 and 3</i> : Assume demand increases at rate of local population growth (COMPASS 2010). However, overall decrease caused by increased staff emphasis on interpretation balanced by increase in teacher-led programs, and no EE Building. <i>Alt 4</i> : Assume increase despite no EE Building because of increased staff emphasis on EE and more teacher-led programs.
Interpretation	21,000	32,720	58,740	58,740	39,670	Current visits include Visitor Center (VC) and participants in interpretive programs. <i>Alt 1</i> : Assume demand increases at rate of local population growth (COMPASS 2010). <i>Alts 2 and 3</i> : Assume staff/volunteers make 30 interpretive contacts on three days per week during 12 peak visitation weeks. Assume contacts at new Visitor Contact Station (VCS) about same as at VC. Although it would be open seasonally, it is at a higher-use location than the VC. <i>Alt 4</i> : Assume reduced staff/volunteers contacts because reduced focus on interpretation (30 contacts on three days per week during eight peak visitation weeks). Assume reduced contacts at the

Recreational Activity	Current Visits	Annual Visits at the End of 15 Years				Assumptions
	(2011)	Alt 1	Alt 2	Alt 3	Alt 4	
						new VCS because only wildlife-dependent activities would be allowed.
Nonwildlife-dependent boating	49,400	55,080	50,040	21,480	0	<i>Alt 1:</i> Assume growth based on logarithmic equation derived from IDPR (2010). Although boating visits would eventually be limited by available parking, projected increases are not expected to exceed parking capacity except on a few days each summer. <i>Alt 2:</i> 19% of ski/tubing currently happens in the eastern section of the East Pool (Appendix L), which approximately corresponds with the proposed no-wake zone. Assume 25% of those who currently ski/tube in that area would be displaced from the lake and the remainder would move to other parts of the East Pool. <i>Alt 3:</i> Assume 39% reduction of Alt 1 projection because 39% of categories corresponding with defined nonwildlife-dependent boating activities (skiing/tubing plus recreation) in USGS study (Appendix L) currently occur in the West Pool. Although some displaced from the East Pool would move to the West, assume that is balanced by amount displaced by the morning no-wake restriction. <i>Alt 4:</i> No nonwildlife-dependent activities allowed.
Swimming and other beach activities	38,700	60,290	60,290	40,700	0	<i>Alt 1:</i> Assume increase at rate of population growth (COMPASS 2010) based on (Bowker et al. 1999) projection. <i>Alt 2:</i> Swimmers directed to designated beaches but allowed elsewhere, so anticipate no change from Alt 1. <i>Alt 3:</i> Assume 75% of beach uses in Alt 2 would occur at the Lower Dam Recreation Area, based on best professional judgment. <i>Alt 4:</i> No swimming allowed.
Walking and jogging	16,500	19,160	19,160	15,330	11,500	<i>Alt 1:</i> Assume 1% constant annual increase (Bowker et al. 1999). <i>Alt 2:</i> Same as Alt 1, assuming most walking/jogging already occurs on wider trails. <i>Alt 3:</i> Assume reduction by 20% because dogs would not be allowed. <i>Alt 4:</i> Assume reduction by 25% because jogging would not be allowed.
Other activities (e.g., picnicking)	11,300	13,120	11,810	11,810	0	<i>Alt 1:</i> Assume 1% constant annual increase (based on Bowker et al. 1999 projection for picnicking). <i>Alt 2:</i> Assume 90% of current picnicking activity

Recreational Activity	Current Visits	Annual Visits at the End of 15 Years				Assumptions
	(2011)	Alt 1	Alt 2	Alt 3	Alt 4	
						occurs at areas designated for picnicking. <i>Alt 3</i> : Assume same as <i>Alt 2</i> . <i>Alt 4</i> : No such activities allowed.
Total (% change from current visits)	223,475	296,255 (+32.6%)	316,025 (+41.5%)	239,475 (+7.2%)	132,915 (-40.5%)	These totals may include some double-counting. For example, projected interpretation visits include contact with nonwildlife-dependent users.

6.5.3 Effects from Wildlife and Habitat Management Actions on Recreational Opportunities and Cultural Resources

Many management actions are proposed to benefit wildlife and habitat on both the Lake Lowell and Snake River Islands Units. Some of these activities may temporarily have minor negative effects on visitors from noise, presence of machinery and staff, and potentially restricted access while the treatments are implemented. However, most are expected, over the course of the CCP, to have long-term positive effects on wildlife habitat and therefore on wildlife-dependent recreational opportunities. These long-term effects are discussed in the next several paragraphs for major wildlife and habitat management actions proposed in the action alternatives.

Efforts to remove carp would have variable effects on recreational opportunities depending on the strategy selected. Short-term effects of seining would be negligible, because seining is usually more effective in fall and winter when the lake is already closed to boats. The long-term improvement in open-water and emergent-bed habitats expected from a reduction in carp biomass through any of the strategies would have an overall intermediate positive effect on waterfowl hunting, fishing, and wildlife observation and photography by improving wildlife habitat and a negligible long-term effect on other activities. If chemical or biological controls were selected for carp control, they could have longer-term negative consequences for all recreational activities through consequences to nontarget sportfish species. Working with Service Regional biologists to assess each type of control method before it is used, based on use elsewhere, should reduce unforeseen impacts.

Opening channels in emergent beds could have a minor short-term negative effect on access for wildlife-dependent and nonwildlife-dependent lake activities during cutting of channels. However, it would have a minor long-term positive effect on fishing and waterfowl hunting by improving access to emergent beds.

Use of prescribed fire in the upland and riparian habitats is proposed in the action alternatives. Although there would be short-term negative impacts to local air quality, access limitations during prescribed burns, and a short-term displacement of species, use of prescribed fire would have a minor long-term positive effect on wildlife-dependent recreational opportunities by improving fish and wildlife habitat.

Reduction in invasive plants in various habitats through improved invasive plant control would have a minor long-term positive effect on wildlife-dependent recreational opportunities by improving fish and wildlife habitat.

Discing of fire lines would continue in the action alternatives, but some would be removed in riparian and upland habitats to reduce habitat fragmentation. This would have a minor negative effect on ease of access for off-trail users in Alternative 2. However, it would not reduce access in Alternatives 3 and 4, where travel is required on designated trails (except during hunting).

Discing of mudflats near Farm Field 5 would have a minor positive effect on wildlife observation and photography opportunities by improving shorebird habitat, and thereby viewing opportunities. It would have a negligible effect on other wildlife-dependent and nonwildlife-dependent opportunities.

In the action alternatives, implementation of seasonal or year-round closures and access restrictions (e.g., on-trail requirements and no-wake zones) to protect important wildlife areas (e.g., eagle nests, grebe colonies, osprey nests, heron rookeries, shorebird feeding areas, and wintering waterfowl closures) would reduce visitor access to some areas. Some of these closures and access restrictions would be implemented based on wildlife activity, so areas that had at one time been closed to protect wildlife activity would be reopened if that activity shifts or disappears. The effects of these closures and access restrictions are discussed in Sections 6.5.4 through 6.5.12 by each type of opportunity.

In all alternatives, staff would monitor the effects of public use on wildlife and consider modifications to the location, timing, and/or type of public use if disturbance to wildlife or habitat degradation reaches unacceptable levels.

The National Historic Preservation Act (NHPA) of 1966, as amended, establishes the Federal Government's policy on historic preservation and the programs through which that policy is implemented. An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the National Register of Historic Places (NRHP). In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, or affected by project elements that would be out of character with the significant property or its setting. Title [36 C.F.R. 800](#) defines effects and adverse effects on historic resources. Cultural resource surveys will be conducted before conducting any major habitat restoration project. Earth-moving activities occurring in proximity to known sites would be monitored because of the potential for buried cultural material in these areas. If any cultural materials are uncovered during excavation, the Regional Historic Preservation Officer would be contacted to review the materials and recommend a treatment that is consistent with applicable laws and policies. The habitat management and restoration projects proposed under all of these alternatives would not be expected to have an adverse effect on historic resources. Major disturbance would be avoided by the survey and consultation process as described in Section 106 of NHPA.

6.5.4 Effects from Public Use and Public Use Management Actions on Quality Waterfowl Hunting

Indicators of effects on waterfowl hunting opportunities are (1) acres available for general waterfowl hunting; (2) area available for youth waterfowl hunt; and (3) management actions that affect hunt quality.

6.5.4.1 Lake Lowell Unit

Under Alternative 1, waterfowl hunting would be allowed in the East Side and South Side Recreation Areas. Human- or electric-powered boats could be used up to 200 yards from the shore. In the East

Side Recreation Area, waterfowl hunting would be walk-in only. A youth waterfowl hunt would be allowed in all designated waterfowl hunt zones in accordance with IDFG regulations. There would be no blinds or designated hunting spots. Portable blinds would be allowed if they are removed at the end of each day. Temporary blinds may be constructed from natural vegetation less than three inches in diameter and would be available on a first-come, first-served basis. Installation of an ADA-compliant hunting opportunity at an appropriate location would be proposed under all alternatives, including the status quo.

Few changes are proposed in Alternative 1. Invasive plant control would continue to be minimal, and therefore invasive plant infestations would increase, thus reducing waterfowl habitat quality. This would have a minor long-term negative effect on waterfowl hunting opportunity.

In Alternative 2 (Preferred Alternative), the waterfowl hunt area would remain the same as the status quo, with the exception of the youth hunt area, which would be restricted to an area previously closed to waterfowl hunting east of Parking Lot 1 to the New York Canal. Although this would reduce the total area available for the youth hunt (1,940 acres in Alternative 1 and 190 acres in Alternative 2), it would open an area that provides better waterfowl habitat and where hunters would be less disturbed by late-season boaters using the waterfowl hunt area. This would therefore likely create a higher-quality youth hunt. An ADA-accessible waterfowl hunting blind would be installed at an appropriate location to improve hunting opportunity for hunters with physical disabilities. Waterfowl hunters would also be limited to 25 shotgun shells per day. This should increase the quality of the hunt by reducing sky busting (described in Objective 2.1) and encouraging ethical behavior. However, limiting the number of shotgun shells would also potentially limit hunting opportunity. In Alternative 2, unlike the other alternatives, anglers would have access to fishing from open shoreline within hunting areas during hunting season. This could increase disturbance to target species from other users and increase safety concerns. However, signs would also be posted at all hunting access points to notify Refuge users when a hunt is underway, which may actually provide a higher-quality hunt by discouraging incursion of nonhunters and thus reducing disturbance to target species from other users and reducing safety concerns. Also, using results of visitor use surveys, the Refuge would evaluate whether to implement restricted upland game hunting hours to reduce conflicts with waterfowl hunters. Both these actions to reduce conflict with other users should increase the quality of the waterfowl hunt.

Alternative 3 would reduce the size of the waterfowl hunting area by reducing the hunt area in the South Side Recreation Area to between Parking Lots 3 and 8 and in the East Side Recreation Area to west of the Leavitt Tract. This would reduce the area available for waterfowl hunting from 2,250 to 1,300 acres. It would also reduce the number of waterfowl hunters by changing the waterfowl hunt to a controlled hunting opportunity (e.g., sign-in/out at parking areas or lottery). This would reduce waterfowl hunting opportunities but should increase hunt quality by reducing crowding. The youth waterfowl hunt area would be larger than the area designated in Alternative 2 but in an area with lower-quality waterfowl habitat. Only wildlife-dependent public use activities would be allowed in waterfowl hunting zones, which would reduce disturbance to hunters.

Alternative 4 is similar to Alternative 3 except that the South Side Recreation Area waterfowl hunting area would be larger, but not be allowed in the East Side Recreation Area, so only 1,800 acres would be available. The youth waterfowl hunt would shift to the east as in Alternative 2. Only wildlife-dependent public use activities would be allowed, which would reduce disturbance to upland hunters from nonwildlife-dependent users.

In all action alternatives, carp removal efforts, opening channels in emergent beds, and reduction of invasive plants would be expected to have a minor positive effect on waterfowl hunting by improving habitat. However, reduction in fire line discing would have a minor negative effect on hunting access by reducing ease of access.

6.5.4.2 Snake River Islands Unit

In Alternative 1, waterfowl hunting, including the youth hunt, would be allowed on all Refuge islands. There would be no blinds or designated hunting spots. Portable blinds would be allowed if they are removed at the end of each day. Temporary blinds may be constructed from natural vegetation less than three inches in diameter and would be available on a first-come, first-served basis.

No recreational changes are proposed in the action alternatives that would affect the quantity or quality of waterfowl hunting on the Snake River Islands Unit.

6.5.4.3 Overall Effects

In Alternative 1, there would be a negligible long-term effect on waterfowl hunting since reduction of hunt quality due to the spread of invasive plants would be balanced by an improvement in hunter access through the construction of a new ADA-accessible hunting opportunity. In Alternative 2, there would be a minor long-term positive effect on visitor opportunities to enjoy quality waterfowl hunting opportunities. In Alternative 3, the hunt area would be reduced from 2,250 acres in Alternative 1 to 1,300 acres, but that would be partially offset by increased hunt quality and reduction of crowding from implementing a controlled hunt and improvements in waterfowl habitat through wildlife and habitat management actions, having an overall minor long-term negative effect on waterfowl hunting. In Alternative 4, reduction of the hunt area from 2,250 acres in Alternative 1 to 1,800 acres, offset by improved habitat for the youth hunt and improvements in waterfowl habitat through wildlife and habitat management actions, would have an overall negligible effect on waterfowl hunting opportunity. Overall, because no recreational changes are proposed, we expect negligible effects on waterfowl hunting opportunities at the Snake River Islands Unit in all alternatives.

6.5.5 Effects from Public Use and Public Use Management Actions on Quality Upland Game Hunting

Indicators of effects on upland hunting opportunities are (1) acres available for upland hunting; and (2) management actions that affect hunt quality.

6.5.5.1 Lake Lowell Unit

In Alternative 1, upland game bird hunting (including mourning dove) would be allowed in the East Side and South Side Recreation Areas at the Lake Lowell Unit. Few changes are proposed in Alternative 1. Invasive plant control would continue to be minimal, and therefore invasive plant infestations would increase, thus reducing upland habitat quality. This would have a minor long-term negative effect on upland hunting.

In Alternative 2, the upland game hunt area would remain the same as the status quo. In Alternative 2, unlike the other alternatives, anglers would have access to fishing from open shoreline within hunting areas during hunting season. This could increase disturbance to target species from other users and increase safety concerns. However, signs would be posted at all hunting access points to notify Refuge users when a hunt is underway, which may actually provide a higher-quality hunt by discouraging incursion of nonhunters and thus reducing disturbance to target species from other users and reducing safety concerns. Using results of visitor use surveys, the Refuge would periodically evaluate whether to implement restricted upland game hunting hours to reduce conflicts with waterfowl hunters, although this potential effect is not evaluated here. If such a reduction in hunting hours were implemented, the total upland hunting opportunity would be reduced. These changes would have a negligible effect on upland hunting.

Alternative 3 would reduce the size of the upland game bird hunting area from 2,250 (Alternatives 1 and 2) to 400 acres by eliminating the hunt in the South Side Recreation Area and eliminating the Leavitt Tract from the hunt zone in the East Side Recreation Area. Only wildlife-dependent public use activities would be allowed in the remaining upland hunting zones, which would increase hunt quality by reducing disturbance to target species from other users and reducing safety concerns. Reduction in the hunt area would have an intermediate long-term negative effect.

In Alternative 4, upland game bird hunting would be completely eliminated from the Lake Lowell Unit, which would have a significant negative effect on upland hunting opportunities.

In all action alternatives, prescribed fire and reduction in invasive plants would be expected to have a minor positive effect on upland hunting by improving upland game habitat. However, reduction in fire line discing would have a minor negative effect on hunting access by reducing ease of access.

6.5.5.2 Snake River Islands Unit

In all alternatives, upland game hunting would continue to be allowed on all Refuge islands. No recreational changes are proposed that would affect the quantity or quality of upland game hunting on the Snake River Islands Unit.

6.5.5.3 Overall Effects

In Alternative 1, there would be a negligible long-term negative effect on upland game bird hunting from the spread of invasive plants due to minimal invasive species management. Alternative 2 would have a negligible effect on visitor opportunities to enjoy quality upland game bird hunting opportunities. In Alternative 3, the hunt area would be reduced, but reduced disturbance from nonwildlife-dependent activities in the hunting area and improvements in upland habitat through wildlife and habitat management actions should increase hunt quality, having an overall minor negative effect on upland game bird hunting. Alternative 4 would have a significant negative long-term effect on upland game bird hunting opportunities by completely eliminating it on the Lake Lowell Unit.

Overall, negligible effects on upland game hunting opportunities would be expected at the Snake River Islands Unit in all alternatives.

6.5.6 Effects from Public Use and Public Use Management Actions on Quality Big Game Hunting

Indicators of effects on big game hunting opportunities are (1) acres available for big game hunting; and (2) management actions that affect hunt quality.

6.5.6.1 Lake Lowell Unit

A new Lake Lowell Unit deer hunt was recently implemented under a different planning process (USFWS 2011a) and began in fall 2012. This hunt would continue unchanged under all alternatives. In Alternative 2, unlike the other alternatives, anglers would have access to fishing from open shoreline within hunting areas during hunting season. This could increase disturbance to target species from other users and increase safety concerns. However, signs would be posted at all hunting access points to notify Refuge users when a hunt is underway, which may actually provide a higher-quality hunt by discouraging incursion of nonhunters and thus reducing disturbance to target species from other users and reducing safety concerns. Under Alternatives 3 and 4, there would be no upland bird hunting within the deer hunting zone and only wildlife-dependent public use activities would be allowed, which may reduce disturbance to target species from other users and reduce safety concerns. However, in Alternative 3, the proposed boardwalk between parking lots 1 and 3 does fall within the deer hunting area, so wildlife-dependent boardwalk users may increase disturbance to target species from other users and increase safety concerns. Overall, changes in access to the deer hunt area would have a negligible to minor negative disturbance effect on deer hunt quality.

In all action alternatives, prescribed fire and reduction in invasive plants would be expected to have a minor positive effect on deer hunting by improving habitat. However, reduction in fire line discing would have a minor negative effect on hunting access by reducing ease of access.

6.5.6.2 Snake River Islands Unit

In all alternatives, big game hunting would be allowed on all Refuge islands. No recreational changes are proposed that would affect the quantity or quality of waterfowl hunting on the Snake River Islands Unit.

6.5.6.3 Overall Effects

In Alternative 1, there would be a negligible long-term negative effect on big game hunting from the spread of invasive plants due to minimal invasive species management. In the action alternatives, a negligible effect would be expected due to hunting acres remaining the same as presently available.

6.5.7 Effects from Public Use and Public Use Management Actions on Quality Fishing

Indicators of effects on fishing opportunities are (1) acres available for boat fishing; (2) area available for shoreline fishing; (3) facilities available for dock fishing; and (4) management actions that affect fishing quality.

6.5.7.1 Lake Lowell Unit

In Alternative 1, the entire lake would be open to boat fishing between April 15 and September 30. Between October 1 and April 14, fishing would be allowed from human-powered boats 200 yards in front of the Upper and Lower Dams (Fishing Areas A and B). Boat fishing is popular throughout the boating season and peaks from April through June. Shoreline fishing would be allowed from open shoreline, with the exception of waterfowl-hunting season, when fishing would be allowed only in Fishing Areas A and B, 200 yards in front of the Upper and Lower Dams (about 120 acres). Shoreline fishing is common from April through September and usually highest in June. During the boating season, there would still be an ADA-accessible fishing dock at the West Upper Dam boat ramp. This is currently the only ADA-accessible one at the Refuge and only designated fishing dock. SUPs would continue to be issued for fishing tournaments with special provisions. Currently, some ice fishing occurs when the lake freezes.

Under all action alternatives, several strategies would improve the quality of fishing. To improve the safety of fishing visitors, signs would be posted at hunting access points to notify Refuge users when a hunt is underway. In addition, new fishing facilities (including ADA-accessible fishing access trails and ADA-accessible docks) would improve fishing quality by providing more accessible shoreline fishing opportunities. Wading access to fishing at the Lake Lowell Unit would be restricted to the boating season (April 15-September 30) except in Fishing Areas A and B. Although the lake is currently closed during that time, the restriction on wading access to fishing is not being communicated to the public, and visitors sometimes wade or use float tubes between October 1 and April 14. If this restriction were enforced, fishing access would be reduced. Finally, if it were possible to increase bottom structure to benefit fish without interfering with the irrigation purpose of the reservoir, the increased structure would improve fishing opportunities by providing fish habitat.

Under Alternative 1, invasive plant control would continue to be minimal, and therefore invasive plant infestations would increase, thus reducing fish habitat quality. This would have a negligible long-term negative effect on fishing.

In Alternative 2, the boat-accessible fishing area would remain the same, with the exception of those areas subject to seasonal wildlife closures (e.g., grebe, eagle, and heron nesting and shorebird feeding). The number of acres closed seasonally would vary by wildlife activity. If seasonal closures like those proposed as part of Alternative 2 had been implemented in 2011, 170 acres would have been closed between February 1 and July 1 and 1,050 acres between April 15 and September 30. There would be additional no-wake areas, including an expansion of the no-wake zone in the East Pool, a 200-yard no-wake buffer along the south shore, and a no-wake area in the Narrows between the East and West Pools. Although these no-wake areas would increase the time to reach some fishing spots, most of the available fishing area would still be accessible by boat, with the exception of those areas subject to seasonal wildlife closures. Access for fishing tournaments would remain unchanged from the status quo.

Also under this alternative, access to bank fishing would remain the same in the East Side Recreation Area and at Gotts Point, again with the exception of those areas subject to seasonal wildlife closures. Gotts Point would also be fully open to vehicle access upon completion of an MOU with Canyon County to resolve law enforcement issues, and ADA-accessible trails and a dock would be provided to improve fishing access. Access to bank fishing would be restricted to trails during the nesting season (February 1-July 31) in all other areas, and open to off-trail travel the rest of the year. Additional trails would be developed to provide fishing access, including at popular fishing points at

Parking Lots 4 and 7 on the south side, from a proposed trail at Murphy's Neck, and at Gotts Point. ADA-accessible docks would be provided at appropriate locations, including the Lower Dam Recreation Area, Upper Dam's east end, Gotts Point, and Parking Lot 1. Fishing opportunities would also increase during waterfowl hunting season, because fishing would be available from the all areas open to access, rather than just Fishing Areas A and B. After the disabled-accessible 0.65-mile trail proposed in Murphy's Neck is installed, fishing access to Murphy's Neck may be moved from road-side parking on Orchard Avenue to the Murphy's Neck trail. If that change were made, it would increase the walking distance for shoreline anglers, but visitor safety and accessibility for people with disabilities. Ice fishing would be allowed in Fishing Areas A and B within 200 yards of the dams, subject to areas posted by the Bureau of Reclamation. Because of additional fishing access through new facilities and reopening of Gotts Point to vehicles, there would be a minor long-term positive effect on fishing access.

Alternative 3 would reduce the fishing area from 7,300 acres accessible by boat in Alternative 1 to 5,800 acres, because the current no-wake zone on the lake's east end and emergent beds between Parking Lots 3 and 8 on the south side and at Murphy's Neck would be closed. In addition, historical grebe nesting colonies would be closed throughout the boating season, with a seasonal closure to protect shorebird foraging habitat from Murphy's Neck to the Narrows, as well as other seasonal closures as in Alternative 2. There would also be additional no-wake areas, including the entire East Pool, a 200-yard buffer from the emergent vegetation on the West Pool's south side, and the West Pool itself from sunrise to noon, thus increasing the time to reach many fishing spots, but reducing disturbance from wake-causing boats and increasing the fishing opportunity from nonwake-causing boats. The lake would close to boating 10 days earlier than under Alternative 1.

Access to bank fishing would be restricted to trails and docks in all areas, thus restricting bank fishing access further than under Alternative 2. Additional trails and docks would be developed to provide additional fishing access, and Gotts Point would be fully open to vehicle access upon completion of an MOU with Canyon County to resolve law enforcement issues.

Alternative 4 reduces the fishing area accessible by boat to 5,400 acres, because emergent beds would be closed between Parking Lots 1 and 3, at Murphy's Neck, and a 100-yard area along the shore between Murphy's Neck and the Narrows. The entire lake would be open only to no-wake boating, thus increasing the time to reach many fishing spots, but also reducing disturbance from wake-causing boats and increasing the fishing opportunity from nonwake-causing boats. Eliminating nonwildlife-dependent boating activities would reduce disturbance to anglers and therefore improve the quality of the experience.

Access to bank fishing would be similar to Alternative 3, with the following exceptions. Gotts Point would remain closed to vehicle access, and an ADA-accessible trail would be installed from Gotts Point parking area 1 to parking area 2 and then the water. Two additional fishing access trails would also be installed at Parking Lots 2 and 3.

In all action alternatives, carp removal efforts and reduction in invasive plants would be expected to have a minor positive effect on fishing by improving fish habitat. Opening channels in emergent beds would improve access to fishing. However, the reduction in fire line discing would have a minor negative effect by reducing ease of fishing access along firebreaks.

6.5.7.2 Snake River Islands Unit

In Alternative 1, fishing would be allowed from all Refuge islands between June 1 and January 31. The Service does not have jurisdiction over the waters of the Snake River, so no management actions are proposed to improve fish habitat. In Alternatives 2 through 4, all islands would be closed for bank fishing until June 15 to protect nesting geese. A few islands (four to six currently) would not open until July 1 to protect colonial-nesting birds. Delaying opening of Refuge islands for fishing from shore until June 15 or July 1 would reduce the opportunity for late spring and early summer shore fishing. However, there are few users at that time of year.

6.5.7.3 Overall Effects

In Alternative 1, there would be a negligible long-term negative effect on fishing from the spread of invasive plants due to minimal invasive species management.

In Alternative 2, although fishing access would be restricted during the nesting season in some areas and no-wake zones would increase the time to reach some fishing spots, most of the available fishing area would still be accessible by boat, management actions would improve fish habitat, and additional trails and docks would improve access at popular fishing areas. Overall, these changes would have a minor long-term positive effect on fishing opportunities.

In Alternative 3, fishing access would be reduced because of permanent on-water closures and increased no-wake zones. This would be partially offset by reductions in disturbance to anglers from wake-causing activities. Although there would be improved access for bank fishing, overall there would be an intermediate long-term negative effect on fishing access at the Lake Lowell Unit.

In Alternative 4, reductions in disturbance to anglers from wake-causing activities would partially offset the further restrictions to on-water fishing access. Gotts Point would also remain closed to vehicles. Overall, there would be a significant long-term negative effect on fishing opportunities.

Although access to bank fishing on the Snake River Islands Unit would be slightly reduced in all action alternatives because of lengthened nesting closures, not many anglers fish from shore above the mean high water line. Because no other changes are proposed to fishing access or regulations, there would be a negligible effect on fishing.

6.5.8 Effects from Public Use and Public Use Management Actions on Quality Wildlife Observation and Photography

Indicators of effects on wildlife observation and photography opportunities are (1) number of miles of trail available; (2) facilities available for wildlife observation and photography; and (3) management actions that affect wildlife observation and photography quality.

6.5.8.1 Lake Lowell Unit

In Alternative 1, wildlife observation and photography would continue to occur throughout the Refuge. Some of the best locations are in the North Side Recreation Area west of the Visitor Center and at the Tio Lane entrance. From the Tio Lane entrance, the East Dike Trail gives access to

wetlands, and the Kingfisher Trail allows access to riparian forests and the lake shore. Gotts Point is a popular place for photographing sunsets. A total of 10 miles of trail would continue to be available.

Most wildlife-watching and photography facilities would continue to be located in the North Side Recreation Area and include the Visitor Center's viewing room and spotting scope, an osprey nesting webcam, trails, two ADA-accessible wildlife-viewing platforms, and a wildlife-viewing blind. Three developed viewing facilities would continue to be available.

Although the most recent compatibility determinations allow walking and jogging (with the exception of competitive jogging) on roads, trails, and firebreaks and not off-trail, the requirement to remain on roads, trails, and firebreaks is not being communicated to the public. People frequently leave trails for wildlife watching and photography, and for other recreational activities. If this restriction were enforced, fishing access would be reduced. Under Alternative 1, the lake would continue to be open to motorized and nonmotorized boats for wildlife observation and photography between April 15 and September 30, and to nonmotorized boats in Fishing Areas A and B the rest of the year.

Under all action alternatives, signs would be posted at hunting access points to notify Refuge users when a hunt is underway. This would improve the observation and photography experience by improving the safety and awareness of visitors. In Alternative 2, off-trail access for wildlife observation and photography would be allowed in the East Side Recreation Area, Lower Dam Recreation Area, and Gotts Point. Gotts Point would also be fully open to vehicle access upon completion of an MOU with Canyon County to resolve law enforcement issues. Access would be restricted to trails during the nesting season (February 1-July 31) in the North and South Side Recreation Areas, but open to off-trail travel the rest of the year. Thus, off-trail access would increase beyond that available in Alternative 1. There would also be some seasonal wildlife closures (e.g., eagle and heron nesting) that would restrict access, but these closures should increase the quality of observation and photography opportunities by reducing wildlife disturbance. There would be a larger no-wake area for wildlife observation and photography. An additional three miles of trails, for a total of 13, and an additional two blinds and platforms would be developed for observation and photography on land, and an on-water self-guided or virtual geocaching opportunity would be developed. Those trails and facilities developed primarily for fishing access (Section 6.5.7.1) would also be available for observation and photography.

Alternative 3 is similar to Alternative 2 except no off-trail access would be allowed anywhere but in the Lower Dam Recreation Area from April 15-September 30. Additional trails and facilities would be the same as in Alternative 2, except the firebreak to the observation platform west of the Visitor Center, from the entrance road parking lot, would be rehabilitated rather than upgraded to a trail, and a 2-mile boardwalk would be proposed between Parking Lots 1 and 3. There would be a total of 14.5 miles of trail and four new blinds and platforms. In addition, no on-water self-guided or virtual geocaching opportunity would be developed. A reduction in the area available for waterfowl and upland game bird hunting would improve the wildlife observation and photography experience in those areas by providing a less disturbed and safer opportunity.

Alternative 4 is similar to Alternative 3 except the boardwalk and its associated docks and bike/walking trail along the entrance road would not be developed, so only 12 miles of trails and two new viewing facilities would be available. Eliminating hunting from the East Side Recreation Area would reduce potential conflicts between user groups and improve the quality of wildlife observation and photography. Eliminating nonwildlife-dependent recreational activities would reduce wildlife

disturbance and improve wildlife observation and photography opportunities. As in Alternative 3, a reduction in the area available for waterfowl and upland game bird hunting would improve the wildlife observation and photography experience in those areas by providing a less disturbed and safer opportunity.

In all action alternatives, carp removal efforts, prescribed fire, invasive plants reduction, and mudflat discing would be expected to have a minor positive effect on wildlife observation and photography by improving habitat and viewing opportunities. However, reduction in fire line discing would have a minor negative effect by reducing ease of access for wildlife observation and photography.

6.5.8.2 Snake River Islands Unit

Under Alternative 1, wildlife observation and photography would continue to be allowed on all Refuge islands between June 1 and January 31 and viewing of islands from the shore year-round.

In Alternatives 2 through 4, all islands would be closed for wildlife watching and photography until June 15 to protect nesting geese. A few islands (four to six currently) would not open until July 1 to protect colonial-nesting birds. Delaying opening of Refuge islands for shore fishing until June 15 or July 1 would reduce the opportunity for late spring and early summer wildlife watching and photography; currently, there is minimal use during that time.

6.5.8.3 Overall Effects

In Alternative 1, the on-trail requirement would be enforced, thus reducing access to wildlife observation and photography opportunities and having a minor long-term negative effect. Wildlife and habitat management actions would be expected to improve viewing opportunities. Although observation and photography access would be restricted during the nesting season in some areas in Alternative 2, those restrictions would improve opportunities by reducing wildlife disturbance. In addition, off-trail travel would be allowed year-round in some areas and seasonally in others; additional trails and viewing facilities would also improve access. Overall, these changes would have a minor positive effect on observation and photography opportunities. In Alternative 3, on-trail travel would restrict wildlife observation and photography, but providing additional facilities and wildlife and habitat management actions would have a positive effect, suggesting an overall negligible or minor long-term negative effect on wildlife observation and photography opportunities. Alternative 4 would be similar to Alternative 3, except with fewer new facilities, resulting in a minor long-term negative effect on access to observation and photography opportunities.

Although wildlife observation and photography on the Snake River Islands Unit would be slightly reduced in the late spring/early summer for all action alternatives, not many users visit the islands during those times. This reduction would have a negligible effect on observation and photography opportunities on the Snake River Islands Unit.

6.5.9 Effects from Public Use and Public Use Management Actions on Quality Environmental Education

Indicators of effects on Environmental Education (EE) opportunities are (1) number of students participating annually in on- and off-site EE programs; and (2) management actions that affect quality of EE opportunities.

6.5.9.1 Lake Lowell Unit

In Alternative 1, the Refuge would continue to offer EE programs and materials correlated with state educational standards both on- and off-site. Requests for on-site programs usually peak in May, while demand for off-site programs is fairly steady between October and May. During FY11, approximately 11,000 people participated in Refuge-led programs, about half on-site and half off-site. In 2010, the Friends of Deer Flat National Wildlife Refuge began providing bus scholarships to fund field trips from local schools. Some requests for guided EE programs have been turned down each year since 2008 because the demand cannot be met with current staffing levels. The Environmental Education Building at the Lower Dam Recreation Area would continue to be available for rent between April 15 and September 30 by teachers and youth group leaders conducting EE programs.

In Alternative 2, interpretation would be emphasized over EE. Appropriate themes and target grades would be selected to refine the scope of the remaining EE programs to those best suited for Refuge field trips, classroom programs, and traveling trunks. Similarly, existing nonschool EE programs (e.g., day camps, Scout Day, Youth Conservation Corps) would be modified to be consistent with the selected themes. Refuge-specific instructor training would be developed, enabling teachers to lead 75 percent of on-site educational programs at the end of 15 years, allowing for more on-site programs than limited Refuge staffing would allow. At least two covered learning facilities would be provided to facilitate EE programs on designated themes. This might include a portable learning lab (trailer) used in areas away from the Visitor Center. Finally, the Environmental Education Building at the Lower Dam Recreation Area would no longer be available to rent because it would be converted to, or replaced by, a visitor contact station. Overall, a decrease to 9,400 participants in EE programs is projected.

Alternative 3 would be the same as Alternative 2.

In Alternative 4, EE would be emphasized over interpretation, but opportunities would otherwise be the same as Alternative 2. Eliminating nonwildlife-dependent recreational activities would reduce wildlife disturbance and improve the quality of on-site EE opportunities. The same amount of EE program participants are projected, as in Alternative 1.

6.5.9.2 Snake River Islands Unit

No changes are proposed in any alternative for EE opportunities on the Snake River Islands Unit.

6.5.9.3 Overall Effects

The effect of Alternative 1 would be negligible because current programs would continue. In Alternatives 2 and 3, there would be a minor long-term positive effect on EE opportunities. Although the EE program shift to emphasize teacher-led programs would, overall, increase quality of on-site opportunities, there would be a reduction in the total number of participants. Alternative 4 would provide similar, though slightly increased, guided EE opportunities as compared to Alternatives 2 and 3. The quality of the experience would be higher due to elimination of nonwildlife-dependent recreational activities. Alternative 4 would have an intermediate long-term positive effect on EE opportunities.

6.5.10 Effects from Public Use and Public Use Management Actions on Quality Interpretation

Indicators of effects on interpretive opportunities are (1) number of visitors participating annually in guided and unguided interpretive programs and (2) management actions that affect quality of interpretation opportunities.

6.5.10.1 Lake Lowell Unit

In Alternative 1, interpretive displays would continue to be available in the Visitor Center. Near the Visitor Center is the self-guided Nature Trail with a habitat brochure that corresponds to numbered posts along the half-mile trail, as well as the Centennial Trail with interpretive signs about the history of the Refuge and reservoir. Regularly scheduled, staff-led interpretive walks and talks would not be offered due to limited staff, despite requests from the public. Volunteer-guided walks are popular when offered in conjunction with special events. Although brochures would continue to be provided in boxes on regulation signs at all major access points, there would be no interpretive signs or maps at the Lake Lowell Unit, with the exception of those along the Centennial Trail. Other than staff and volunteers at the Visitor Center, there would be no staff or volunteers stationed at high-use Refuge areas. Currently, 21,000 visitors participate annually in guided and unguided interpretive programs, including visiting the Visitor Center.

In Alternative 2, interpretation would be emphasized over EE. Guided interpretive opportunities would be increased by providing volunteer- and staff-led guided and roving interpretive programs at high-use visitor access points on selected themes and doubling, from two to four, the number of special events hosted on-site. Unguided opportunities would be provided by installing additional interpretive signs on new and existing trails and facilities, as well as by installing a nature exploration area at the Lower Dam Recreation Area. Use of the Visitor Center auditorium would be restricted to wildlife-dependent recreation groups, but this would not reduce interpretive opportunities, as current nonwildlife-dependent groups are not providing interpretive opportunities. An increase to 37,700 participants annually would be projected.

Alternative 3 would be the same as Alternative 2.

In Alternative 4, EE would be emphasized over interpretation, but EE and interpretive opportunities would otherwise be the same as Alternative 2, except there would be no nature exploration area at the Lower Dam Recreation Area and only three special events would be hosted on-site. Eliminating nonwildlife-dependent recreational activities would reduce wildlife disturbance and improve the quality of interpretive opportunities. A smaller increase to 25,400 participants annually would be projected.

6.5.10.2 Snake River Islands Unit

In Alternative 1, interpretive signs and maps would continue at many of the most-used boat launches accessing the Snake River Islands Unit. No changes are proposed in the action alternatives for interpretive opportunities there.

6.5.10.3 Overall Effects

Alternative 1 effects would be negligible as current programs would continue. In Alternatives 2 and 3, there would be an intermediate long-term positive effect on interpretive opportunities, because staff and volunteer emphasis on interpretation would increase guided and unguided opportunities. Alternative 4 would provide similar, though reduced, opportunities for interpretation as compared to Alternatives 2 and 3. The interpretive experience quality would be higher due to the elimination of nonwildlife-dependent recreational activities. Alternative 4 would have an intermediate long-term positive effect on interpretive opportunities.

6.5.11 Effects from Public Use and Public Use Management Actions on Water-based Nonwildlife-dependent Recreation

Indicators of effects on water-based nonwildlife-dependent activities are (1) acres available for boating; (2) acres available for wake-generating activities; (3) number of designated swim beaches; (4) types of activities allowed; and (5) management actions that affect water-based nonwildlife-dependent recreational opportunities.

6.5.11.1 Lake Lowell Unit

In addition to the priority wildlife-dependent activities that would continue at the Lake Lowell Unit under Alternative 1, many water-based nonwildlife-dependent public uses would also continue. The lake would continue to be open to boating between April 15 and September 30. A total of 9,000 acres would be available for boating, and 7,300 acres for wake-causing activities. Between October 1 and April 14, human-powered boats or boats with electric motors would be allowed for waterfowl hunting in the South Side Recreation Area and human-powered boats in Fishing Areas A and B. Improved boat ramps would still be located at the Lower Dam Recreation Area and the east and west ends of the Upper Dam. Unimproved ramps would be available at Parking Lots 1 and 7. All ramps would still be subject to closure due to low water levels. There would be a no-wake zone on the east end of the lake. Although boating supports fishing, wildlife watching, and photography, the majority (65 percent) of boaters at the lake are pursuing nonwildlife-dependent recreation (Table 6-2). Nonwildlife-dependent boating activities include motorized and nonmotorized boating; tow-behind activities such as waterskiing and wakeboarding; use of personal watercraft; and sailing, windsurfing, and kiteboarding. These activities would continue to be allowed. SUPs have been issued in recent years to hold sailing regattas at Lake Lowell, launching from the Lower Dam Recreation Area. These events would still be allowed under Alternative 1.

Swimming and other beach activities are popular at Lake Lowell. Under Alternative 1, the only designated swimming beach would be at the Upper Dam's east end. Swimming would likely still occur along any open shoreline and from boats in open water.

Ice skating occurs occasionally on Lake Lowell in winter. Because of safety concerns, (Section 2.3.1) ice-related activities other than ice fishing would not be allowed under any alternative.

In Alternative 2, the boat-accessible area would remain the same as Alternative 1, except for those areas subject to seasonal wildlife closures (e.g., grebe, eagle, and heron nesting and shorebird feeding). The number of acres closed seasonally would depend on wildlife activity. If proposed seasonal closures under Alternative 2 had been implemented in 2011, 170 acres would have been

closed between February 1 and July 1 and 1,050 acres between April 15 and September 30. Such seasonal closures would have a minimal effect on nonwildlife-based activities, because they would mostly occur in open water (Appendix L) where closures would be minimal. At least one ADA-accessible launch would be provided for kayaks and canoes. This new launch would have a minor positive effect on boating opportunities.

There would be additional no-wake areas, including expanding the no-wake zone in the East Pool. According to the USGS lake use study (Appendix L), only about 19 percent of all tow-behind activities and 19 percent of other recreation (e.g., swimming from boats) occurred in this area; some of these users would presumably shift into the wake-allowed areas. There would also be a no-wake zone in the Narrows and a 200-yard no-wake buffer along the south shore, but open water users in these areas could also presumably shift into the wake-allowed areas.

Boaters would not be allowed to use internal or external wake-generating devices (e.g., ballasts), anchor or pull onto land adjacent to closed areas. However, less than two percent of boaters anchor along the bank (Appendix L).

Kiteboarding and windsurfing would still be allowed to launch from any open shoreline but would be required to comply with no-wake zones. Sailing and sailing regattas would still be allowed.

Ice skating would not be allowed. This would have a negligible to minor negative effect on recreational opportunities, because very few people ice-skate on Lake Lowell.

Swimmers would be directed to two designated swim beaches (east Upper Dam boat launch and Lower Dam Recreation Area), but swimming would be allowed elsewhere, so no effect on swimming opportunities is expected. The designated swimming areas would be monitored for water quality affecting human health, thus increasing swimmers' safety.

In Alternative 3, the boat-accessible area would be reduced from Alternative 2, due to closures to the current no-wake zone on the lake's east end and emergent beds between Parking Lots 3 and 8 on the south side and at Murphy's Neck. Historical grebe nesting colonies would be closed throughout the boating season, and a seasonal closure to protect shorebird foraging habitat from Murphy's Neck to the Narrows, as well as other seasonal closures, as in Alternative 2. There would be 5,800 acres available for boating. In addition, the lake would close to boating on September 20 rather than September 30, slightly reducing boating season.

There would also be additional no-wake areas, including the entire East Pool, a 200-yard buffer from the emergent vegetation on the West Pool's south side in the West Pool, and the entire West Pool from sunrise to noon, thus eliminating many opportunities for nonwildlife-dependent recreation. This would leave 3,212 acres available for wake-causing activities. The lake would close to boating September 20, 10 days earlier than under Alternative 1.

Kiteboarding and windsurfing would be further restricted from Alternative 2, with launching allowed only from the Lower Dam Recreation Area. Typical wind conditions make launching in this location difficult. This restriction would therefore have an intermediate long-term negative effect on recreational opportunities.

These changes would have an intermediate negative effect on recreational opportunities at Lake Lowell. However, there are three reservoirs within 60 miles of Lake Lowell (Table 5-7) that offer

similar nonwildlife-dependent recreation. According to the 2006-2010 Idaho SCORTP report (IDPR 2006), 73 percent of surveyed Idahoans said the most they were willing to travel to their favorite outdoor recreation site for less than one day's activity was two hours or less.

As in Alternative 2, boaters would not be allowed to use internal or external wake-generating devices (e.g., ballasts) or to anchor or pull onto land adjacent to closed areas.

Swimming would be allowed only at a designated swim beach at the Lower Dam Recreation Area. Eliminating the swimming beach at the Upper Dam would have an intermediate negative effect on swimming opportunities, because it is currently very popular, especially with those who live closer to the Upper Dam.

In Alternative 4, no nonwildlife-dependent recreational activities would be allowed.

6.5.11.2 Snake River Islands Unit

The Refuge does not have management control of lands below the ordinary high water mark and has no control over water-based activities in the Snake River.

6.5.11.3 Overall Effects

In Alternative 1, there would be no changes to water-based nonwildlife-dependent recreational opportunities, leading to a negligible long-term effect. Overall, proposed changes in Alternative 2 would have a minor long-term negative effect on water-based nonwildlife-dependent recreation because of seasonal wildlife closures and more no-wake zones. In Alternative 3, with fewer swimming areas, more closed areas, and more no-wake zones, there would be an intermediate long-term negative effect on water-based recreational opportunities. In Alternative 4, no nonwildlife-dependent recreation would be allowed, which would have a significant long-term negative effect.

6.5.12 Effects from Public Use and Public Use Management Actions on Land-based Nonwildlife-dependent Recreation

Indicators of effects on land-based nonwildlife-dependent activities are (1) miles of trail available for walking on-leash pets, and riding horses; (2) miles of trail available for bicycling; (3) types of activities allowed; and (4) management actions that affect land-based nonwildlife-dependent recreational opportunities.

6.5.12.1 Lake Lowell Unit

In addition to providing the priority wildlife-dependent activities in Alternative 1, many land-based nonwildlife-dependent public uses would also continue. Walking with dogs, jogging, bicycling, and horseback riding currently occur throughout the year, both on- and off-trail. 10.5 miles of trail are available for walking on-leash dogs, riding horses, and bicycling. Track teams have historically used the road/trail west of the Visitor Center for practice sessions, even though the most recent compatibility determination did not allow competitive jogging. This restriction has been enforced in recent years and would continue to be enforced under Alternative 1. Geocaching currently occurs on the Refuge. Local geocachers have been notified that caching is not allowed on the Refuge, but caches are still often placed on the Refuge or on private land accessed through off-trail travel across

Refuge land. Geocaching would continue to be prohibited under Alternative 1. Picnicking would continue to be allowed as it currently occurs: primarily at the Lower Dam Recreation Area, which offers both a covered picnic shelter and scattered picnic tables. People also picnic at other access points. Visitors often request to reserve the shelter for weddings, birthdays, or other events, and it is would continue to be available on a first-come, first-served basis. Cross-country skiing would continue to be allowed on roads and trails. Because of the lack of heavy snowfall and/or enduring snow cover in the Treasure Valley, cross-country skiing is an infrequent Refuge use.

Under all action alternatives, signs would be posted at hunting access points to notify Refuge users when a hunt is underway. This would improve the experience of nonwildlife-dependent visitors by improving the safety and awareness of these visitors.

Although the most recent compatibility determinations allow walking and jogging (with the exception of competitive jogging) on roads, trails, and firebreaks and not off-trail, the requirement to remain on roads, trails, and firebreaks is not being communicated to the public, and visitors frequently leave trails. If Alternative 1 were selected, this requirement would be enforced, reducing off-trail access.

In Alternative 2, unleashed dogs would not be allowed on the Refuge. Leashed dogs, horses, and bikes would not be allowed on the Nature, Centennial, or Murphy's Neck Trails. However, nonwildlife-dependent activities would be allowed on the wider trails (entrance road and the East Dike, Kingfisher, and Gotts Point Trails, and the Observation Hill Trail System) that provide adequate space for multiple-use activities. Walking leashed dogs would also be allowed in the Lower Dam Recreation Area. In addition, owners would be required to remove dog feces. Approximately 8.75 miles of trail would be available for walking on-leash dogs, riding horses, and bicycling.

There would also be some seasonal wildlife closures (e.g., eagle and heron nesting) that would restrict access to a variable number of acres annually. Walking with dogs, horseback riding, and bicycling currently occur mostly on the designated trails, so the proposed changes would have a minor negative effect on nonwildlife-dependent recreational opportunities and a minor positive effect on wildlife-dependent recreationists using the narrow trails. Cross-country skiing would not be allowed. This would have a negligible to minor negative effect on recreational opportunities, because very few people cross-country ski Lake Lowell.

Picnicking would be allowed only in designated areas at the east end of the Upper Dam and at the Lower Dam Recreation Area. This is where most picnicking currently happens, so the proposed change would have a minor negative effect on picnicking opportunities. Nonwildlife-dependent group activities (e.g., weddings, birthday parties, memorial services, retreats, and other activities) would be allowed only at the Lower Dam Recreation Area, and an SUP would be required with appropriate stipulations.

In Alternative 3, dogs and horses would not be allowed at the Refuge, and bicycling would be allowed only along the proposed trail adjacent to the entrance road (0.75 miles). This would have a significant negative effect on the opportunity to participate in dog walking, horseback riding, and bicycling.

Alternative 4 would be similar to Alternative 3 except that bicycling would not be allowed.

6.5.12.2 Snake River Islands Unit

Currently, nonwildlife-dependent recreational activities rarely occur on the Refuge islands. The alternatives do not propose to change the nonwildlife-dependent activities that are allowed on the islands. Delaying opening of Refuge islands to public entry from June 1 as in Alternative 1 until June 15 or July 1 in the action alternatives would slightly reduce recreational opportunities. However, this would have a negligible effect because there are so few people that access the islands for these uses. In Alternative 4, no nonwildlife-dependent recreational activities would be allowed.

6.5.12.3 Overall Effects

In all alternatives, the effects to land-based recreation on the Snake River Islands Unit would be negligible.

In Alternative 1, the requirement to stay on-trail on Lake Lowell Unit would begin to be enforced, thus reducing access and having a minor long-term negative effect. Overall, proposed changes in Alternative 2 would have a minor long-term negative effect on land-based nonwildlife-dependent recreation because of a reduction in miles of trail available for walking on-leash dogs, riding horses, and bicycling on the Lake Lowell Unit. Alternative 3, with the elimination of horseback riding and walking with dogs and the reduction in areas open for bicycling, would have a significant long-term negative effect on land-based recreational opportunities. In Alternative 4, no nonwildlife-dependent recreation would be allowed on either Unit, which would have a significant long-term negative effect.

6.5.13 Effects from Public Use and Public Use Management on Cultural Resources

The National Historic Preservation Act (NHPA) of 1966, as amended, establishes the Federal Government's policy on historic preservation and the programs through which that policy is implemented. An impact to cultural resources would be considered significant if it adversely affects a resource listed in or eligible for listing in the National Register of Historic Places (NRHP). In general, an adverse effect may occur if a cultural resource would be physically damaged or altered, isolated from the context considered significant, affected by project elements that would be out of character with the significant property or its setting. Title [36 C.F.R. 800](#) defines effects and adverse effects on historic resources.

Cultural resource surveys will be conducted before the onset of any major construction project. These projects may include, but are not limited to, the construction of roads, trails, bridges, dikes, and visitor facilities. Earth moving activities occurring in proximity to known sites would be monitored because of the potential for buried cultural material in these areas. If any cultural materials are uncovered during excavation, the Regional Historic Preservation Officer would be contacted to review the materials and recommend a treatment that is consistent with applicable laws and policies. Any new cultural resources identified during the survey would be recorded and evaluated for eligibility to the NRHP. If any sites are determined to be eligible to the NRHP, the restoration plans would need to be assessed for potential effects to the historic property. If effects are possible, the proposal would be reviewed to ensure that the effects have the least impact to original materials and are in conformance with the Secretary of the Interior's Standards for the Treatment of Historic Properties. Changes that comply with the Secretary's Standards would have no adverse effect on

Historic Properties. Once an assessment has been completed, the findings would be forwarded to State Historic Preservation Officer (SHPO) for concurrence. Implementation of the procedures described above is expected to avoid adverse effects to historic resources; however, additional analysis under NHPA may be required once specific details are known.

The construction and public use facilities proposed under all of the alternatives would not be expected to have an adverse effect on historic resources. Major disturbance would be avoided by the survey and consultation process as described in Section 106 of NHPA described above. Expansion of facilities and trails under the alternatives would receive the same scrutiny, to ensure they would not detract from cultural resources; therefore, no adverse effects to cultural resources as a result of human activity within the Refuge are anticipated.

Incorporating cultural history as an integral part of interpretive and environmental education programming can have a positive effect on cultural resources. By providing a deeper understanding of the cultural resources and the role they represent on the landscape may foster appreciation and respect for cultural resources. Cultural history as explored in the setting of a wildlife refuge is about how people have interacted with, shaped, and been influenced by the environment. Native uses of plants for food, shelter, and tools; the cultural significance of certain animal species for food, identity, etc.; and traditional management and/or harvesting activities (fish weirs, controlled burning).

Section 110 of the NHPA requires Federal agencies to create a program to identify and protect historic properties. This program includes the nomination of eligible properties to the National Register of Historic Places; the designation of a qualified agency historic preservation officer; conducting agency programs and activities so that preservation values are considered; and the authority of Federal agencies to include the costs of preservation activities within overall project costs during undertakings. Many opportunities exist to comply with Section 110, including but not limited to the development of interpretive materials and exhibits, Refuge-based cultural heritage curriculum and resources for use both on and off Refuge, and a systematic program for recording and evaluating the Refuge's cultural resources. These opportunities also present excellent prospects for partnerships with tribal communities and historical societies.

Development of a more comprehensive understanding and inventory of cultural resources onsite would occur under Alternatives 2, 3 and 4. The increased gathering of data and knowledge will help the refuge to protect and understand the cultural resources of this area which is a slight positive effect for cultural resources as they would be more protected.

Under Alternatives 2, 3, and 4 Partnerships, interpretation, and education would be expanded, compared to Alternative 1. This work will strengthen current partnerships and provide high quality interpretation and education which would assist in laying the ground work for establishment of more effective partnerships and coordination. This would contribute to the public's understanding and appreciation for archaeological and historic resources and would be a slight positive effect to cultural resources.

6.5.13.1 Overall Effects

Under Alternative 1 cultural resources would receive basic consideration under Section 106 of the NHPA on a project (undertaking) by project basis resulting in a minor negative long-term effect. Under Alternatives 2, 3, and 4 increases in consideration provided through proactive cultural

resource inventories and evaluations and an increase in the interpretation of cultural resources are expected to result in a minor long-term positive effect.

6.5.14 Amount of Illegal Use

Some of the same Refuge qualities that attract legitimate Refuge visitors—solitude, open public spaces, wooded areas, and minimal human interference—also attract individuals seeking places for illegal activities. Under all alternatives, the Refuge intends to curb illegal activities and create a safer environment for visitors. We would use a variety of techniques to improve visitor understanding of Refuge regulations. We would continue to partner with other law enforcement agencies, including meeting annually to discuss law enforcement and emergency response needs, issues, and opportunities to partner. Under all action alternatives, we would also work with the County Sheriff to (1) develop an MOU to increase on-refuge patrols on both land and water, to enforce existing State decibel limits, and to allow enforcement of other Refuge regulations, and (2) codify Refuge regulations or create a joint jurisdiction agreement so that the County Sheriff’s deputies can enforce Refuge regulations. The action alternatives also provide the potential to use a variety of technical enhancements to deter and identify illegal activities. The actions outlined above would result in intermediate positive effects to recreational opportunities by creating a safer environment for all users.

6.5.15 Environmental Justice

Given the limited demographic information available for visitors of the Refuge, it is difficult to determine if there would be any increased impacts to lower-income or diverse communities. Because Alternative 1 is not proposing any major changes, there should be no environmental justice issues different from the status quo. An increase in free facilities and interpretation opportunities under Alternative 2 (Preferred Alternative) has the potential to provide a positive effect on lower-income communities by increasing access to wildlife-dependent recreational opportunities. The potential for the removal of swimming at the Upper Dam as proposed in Alternative 3 may disproportionately impact lower-income or diverse communities. It is possible under Alternative 4 that some lower-income communities may be negatively impacted by the reduction in free swimming and picnicking opportunities.

6.6 Economic Effects

The following economic effects analysis was compiled by the Policy Analysis & Science Assistance Branch of the USGS.

6.6.1 Methods for a Regional Economic Impact Analysis

Economic input-output models are commonly used to determine how economic sectors would and would not be affected by demographic, economic, and policy changes. The economic impacts of the management alternatives for the Refuge were estimated using IMPLAN (Impact Analysis for Planning), a regional input-output modeling system developed by the U.S. Forest Service. IMPLAN is a computerized database and modeling system that provides a regional input-output analysis of economic activity in terms of 10 industrial groups involving more than 400 economic sectors (Olson and Lindall 1999). The IMPLAN model draws upon data collected by the Minnesota IMPLAN

Group from multiple Federal and State sources including the Bureau of Economic Analysis, Bureau of Labor Statistics, and the U.S. Census Bureau (Olson and Lindall 1999). For the Refuge analysis, the year 2009 IMPLAN 3.0 data profiles for Ada and Canyon counties were used for the local area analysis. The IMPLAN county level employment data estimates were found to be comparable to the U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System data for the year 2009.

Because of the way industries interact in an economy, activity in one industry affects activity levels in several other industries. For example, if more visitors come to an area, local businesses would purchase extra labor and supplies to meet the increased demand for additional services. The income and employment resulting from visitor purchases from local businesses represent the direct effects of visitor spending within the economy. Direct effects measure the net amount of spending that stays in the local economy after the first round of spending; the amount that does not stay in the local economy is termed a leakage (Carver and Caudill 2007). In order to increase supplies to local businesses to meet increased demand, input suppliers must also increase their purchases of inputs from other industries. The income and employment resulting from these secondary purchases by input suppliers are the indirect effects of visitor spending within the economy. Employees of the directly affected businesses and input suppliers use their incomes to purchase goods and services. The resulting increased economic activity from new employee income is the induced effect of visitor spending. The indirect and induced effects are known as the secondary effects of visitor spending. “Multipliers” (or “response coefficients”) capture the size of the secondary effects, usually as a ratio of total effects to direct effects (Stynes 2012). The sums of the direct and secondary effects describe the total economic impact of visitor spending in the local economy.

For each alternative, regional economic effects from the IMPLAN model are reported for the following categories:

- **Employment** represents the change in the number of jobs generated in the region from a change in regional output. IMPLAN estimates for employment include both full-time and part-time workers, which are measured in total jobs.
- **Labor income** includes employee wages and salaries, including income of sole proprietors and payroll benefits.
- **Value added** measures contribution to gross domestic product. Value added is equal to the difference between the amount an industry sells a product for and the production cost of the product, and is thus net of intermediate cost of goods.

This economic impact analysis provides the potential economic effects associated with the implementation of the CCP/EIS’s management alternatives for Deer Flat Refuge. The economic impacts reported here are on an annual basis in 2011 dollars. Large management changes often take several years to achieve. The estimates reported for all the alternatives represent the final average annual economic effects after all changes in management have been implemented.

6.6.2 Impacts from Revenue Sharing

Under provisions of the Refuge Revenue Sharing (RRS) Act, local counties receive an annual payment for lands that have been purchased by full fee simple acquisition by the Service. Payments are based on the greater of 75 cents per acre or 0.75 percent of the fair market value of lands acquired by the Service. Even though there is a formula to determine these payment amounts, the exact

amount of the annual payment depends on Congressional appropriations, which may or may not follow the RRS Act formula. In recent years, the appropriations have been lower than the fully funded amount (i.e., the amount determined by applying the RRS Act formula). In FY10, actual RRS payments were 21 percent of authorized levels. FY10 RRS payments (made in 2011) totaled \$4,547 to communities in Canyon County. Table 6-4 shows the resulting economic impacts of RRS payments under all alternatives. Accounting for both the direct and secondary effects, RRS payments under any one of the four CCP/EIS alternatives would generate total annual economic impacts of \$1.9 thousand in labor income and \$2.8 thousand in value added in the local two-county area.

Table 6-4. Annual Impacts from Refuge Revenue Sharing Payments Under Any CCP/EIS Alternative

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Direct effects	0	\$1.4	\$1.8
Secondary effects	0	\$0.5	\$1.0
Total Economic Impact	0	\$1.9	\$2.8

Note: The annual impact from Refuge revenue sharing payments would be the same regardless of which of the four CCP alternatives is selected for implementation.

6.6.3 Impacts from Public Use and Access Management

6.6.3.1 Refuge Visitor Expenditures in Local Economy

Spending associated with recreational visits to national wildlife refuges generates significant economic activity. The FWS report *Banking on Nature: The Economic Benefits of National Wildlife Refuges Visitation to Local Communities* estimated the impact of national wildlife refuges on their local economies (Carver and Caudill 2007). According to the report, more than 34.8 million visits were made to national wildlife refuges in FY 2006, which generated \$1.7 billion in sales in regional economies. Accounting for both the direct and secondary effects, spending by national wildlife refuge visitors generated nearly 27,000 jobs, and over \$542.8 million in employment income (Carver and Caudill 2007). Approximately 82 percent of total expenditures were from nonconsumptive activities, 12 percent from fishing, and 6 percent from hunting (Carver and Caudill 2007).

The priority “Big Six” wildlife-dependent uses—hunting, fishing, wildlife observation and photography, interpretation, and environmental education—are offered on the Lake Lowell Unit. Additionally, several other nonpriority uses occur on the Refuge including nonwildlife-dependent boating, swimming, jogging, and picnicking.

This section focuses on the regional economic impacts associated with Refuge visitation. Annual visitation estimates are based on several sources of Refuge statistics including counts of visitors entering the Visitor Center, counts of vehicles at dispersed access sites, and general observation by Refuge personnel. Annual visitation estimates are on a per-visit basis. Visitor spending profiles are estimated on an average per-day (8-hour) basis. Because some visitors only spend short amounts of time visiting the Refuge, counting each visit as a full visitor day would overestimate the economic impact of Refuge visitation. In order to properly account for the amount of spending, the annual number of visits were converted to visitor days. Results from a recent visitor survey conducted during the summer of 2011 (Sexton et al. 2012) showed that Refuge visitors spend on average five hours for fishing and nonwildlife-dependent boating; four hours for swimming; and three hours for

wildlife-related nonconsumptive activities (wildlife watching and photography, environmental education, and interpretation) and land-based nonwildlife-dependent activities (walking, jogging, and picnicking). Refuge personnel estimate that big game and waterfowl hunters spend six hours and that upland game and other migratory bird hunters spend approximately four hours on the Refuge.

To determine the local economic impacts of visitor spending, only spending by persons living outside of the local two-county area are included in the analysis. The rationale for excluding local visitor spending is twofold. First, money flowing into Ada and Canyon counties from visitors living outside the local area (hereafter referred to as nonlocal visitors) is considered new money injected into the local economy. Second, if residents of the local two-county area visit the Refuge more or less due to the management changes, it is likely that they would correspondingly change the spending of their money elsewhere in that local area, resulting in no net change to the local economy. These are standard assumptions made in most regional economic impact analyses at the local level. However, it is possible that potential Refuge management actions that would restrict boating and other nonpriority recreation at the Refuge could result in visitors from the local area shifting their expenditures from Canyon County to Ada County or possibly going outside of Ada and Canyon counties for recreation opportunities at reservoirs outside of the two-county area. For more information regarding the contribution of local Refuge visitation, Appendix M provides a contribution analysis of local visitor expenditures in the two-county area. Refuge personnel determined the percentage of nonlocal Refuge visitors based on parking lot surveys. Table 6-5 shows the estimated percent of current Refuge visits and visitor days by visitor activity.

Table 6-5. Estimated Current Annual Refuge Visitation

Visitor Activity	Total Annual Number of Visits	Number of Hours Spent at the Refuge	Total Annual Number of Visitor Days ^a	Percentage of Nonlocal Visits	Number of Nonlocal Visitor Days ^a
Priority Uses					
Fishing	45,300	5	28,313	7%	1,982
Big game hunting	75	6	56	8%	5
Waterfowl hunting	5,100	6	3,750	8%	300
Other migratory bird hunting (mourning dove)	100	4	50	8%	4
Upland game hunting	1,100	4	550	8%	44
Nonconsumptive: wildlife watching and photography, environmental education, and interpretation	55,900	3	20,963	10%	2,096
Nonpriority Uses					0
Nonwildlife-dependent boating	49,400	5	30,875	13%	4,014
Swimming and other beach activities	38,700	4	19,350	13%	2,516
Land-based nonwildlife-dependent (walking, jogging, and other activities (e.g., picnicking))	27,800	3	10,425	13%	1,355
Total Visitation	223,375		114,331		12,315

^a One visitor day = eight hours.

The Refuge staff used several sources to project changes in visitation by activity over the next 15 years for each alternative. The Refuge staff estimated visitor projections based on the following considerations: Idaho and national visitation trend data; changes in recreational programs, facilities,

and resources under each alternative; and changes observed in visitation at the Refuge over the last 10 years (i.e., Refuge staff experience and judgment).

A nonlocal visitor usually buys a wide range of goods and services while visiting an area. Major expenditure categories include lodging, restaurants, supplies, groceries, and recreational equipment rental. In this analysis, we use average daily visitor spending profiles from the *Banking on Nature* report (Carver and Caudill 2007) that were derived from the 2006 National Survey of Fishing, Hunting, and Wildlife-associated Recreation (the National Survey; USFWS and U.S. Census Bureau 2007). The National Survey reports trip-related spending of state residents and nonresidents for several different wildlife-associated recreational activities. For each recreation activity, spending is reported in the categories of lodging, food and drink, transportation, and other expenses. Carver and Caudill (2007) calculated the average per-person per-day expenditures by recreation activity for each Service region. We used the spending profiles for nonresidents for Region 1 (which includes Idaho), and updated the 2006 spending profiles to 2011 dollars using the Consumer Price Index Inflation Calculator. Average daily spending profiles for nonresident visitors to Region 1 for fishing (\$65.98 per day), big game hunting (\$94.98 per day), upland game hunting (\$172.41 per day) and waterfowl hunting (\$192.73 per day) were used to estimate nonlocal visitor spending for Refuge fishing and hunting related activities. The average daily nonresident spending profile for nonconsumptive wildlife recreation (observing, feeding, or photographing fish and wildlife) (\$121.59 per day) was used for all nonconsumptive wildlife viewing activities including nonpriority swimming and beach activities and land-based nonwildlife-dependent activities.

Banking on Nature does not include a spending profile for boating. To account for expenditures by boaters, it was assumed that boaters have similar expenditures to other nonconsumptive wildlife recreationists, along with additional fuel expenses to power motorboats. Based on this assumption, the boater spending profile for this analysis was constructed by adding average daily boating fuel expenditure costs to the average daily nonresident spending profile for nonconsumptive wildlife recreation from *Banking on Nature*. Average daily boating fuel expenditures per party were estimated by multiplying the average outboard fuel consumption for two- and four-stroke boats (3.2 gallons per hour; Nissan Marine 2012) by the U.S. average conventional retail gasoline prices for the summer of 2011 (May-August) (\$3.68; U.S. Energy Information Administration 2012). Average daily boating fuel expenditures per person were then calculated by dividing average daily boating fuel expenditures per party by the average number of persons in a boating party (four persons per party; Sexton et al. 2012). This resulted in an average daily boating fuel expenditure of \$23.57 per day and total nonresident daily boating expenditures of \$145.16 per day.

Total spending by nonlocal Refuge visitors was determined by multiplying the average nonlocal visitor daily spending by the number of nonlocal visitor days at the Refuge. The economic impacts of each alternative were estimated using IMPLAN. Table 6-6 summarizes the economic impacts associated with current nonlocal Refuge visitation by activity for Alternative 1. Under Alternative 1, nonlocal Refuge visitors would spend approximately \$1.95 million in the local economy annually. This spending would directly account for 19 jobs, \$538.4 thousand in labor income, and \$877.6 thousand in value added in the local economy. The secondary or multiplier effects would generate an additional nine jobs, \$309.7 thousand in labor income, and \$546.2 thousand in value added. Accounting for both the direct and secondary effects, spending by non-local visitors for Alternative 1 would generate total economic impacts of 28 jobs, \$848.1 thousand in labor income, and \$1.4 million in value added.

Table 6-6. Average Annual Impacts of Nonlocal Visitor Spending by Activity for Alternative 1

Alternative 1	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Priority uses			
Fishing			
Direct effects	1	\$36.4	\$58.7
Secondary effects	1	\$20.8	\$36.6
<i>Total effect</i>	2	\$57.2	\$95.3
Hunting (big game, waterfowl, and other migratory birds)			
Direct effects	1	\$17.9	\$28.6
Secondary effects	0	\$9.8	\$17.3
<i>Total effect</i>	1	\$27.7	\$45.9
Nonconsumptive (wildlife watching and photography, environmental education, and interpretation)			
Direct effects	4	\$111.4	\$182.1
Secondary effects	2	\$67.7	\$118.9
<i>Total effect</i>	6	\$179.1	\$301.0
Nonpriority uses			
Nonwildlife-dependent boating			
Direct effects	7	\$197.9	\$322.6
Secondary effects	3	\$105.3	\$187.0
<i>Total effect</i>	10	\$303.2	\$509.6
Swimming and other beach activities			
Direct effects	4	\$124.7	\$203.8
Secondary effects	2	\$75.7	\$133.0
<i>Total effect</i>	6	\$200.4	\$336.8
Land-based nonwildlife-dependent (walking, jogging, and other activities, e.g., picnicking)			
Direct effects	2	\$50.1	\$81.8
Secondary effects	1	\$30.4	\$53.4
<i>Total effect</i>	3	\$80.5	\$135.2
Aggregate Nonlocal visitation			
Direct effects	19	\$538.4	\$877.6
Secondary effects	9	\$309.7	\$546.2
<i>Total effect</i>	28	\$848.1	\$1,423.8

Table 6-7 summarizes the economic impacts associated with current nonlocal Refuge visitation by activity for Alternative 2. Under Alternative 2, nonlocal Refuge visitors would spend approximately \$1.99 million in the local economy annually. This spending would directly account for 19 jobs, \$543.9 thousand in labor income, and \$887.1 thousand in value added in the local economy. The secondary or multiplier effects would generate an additional 10 jobs, \$314.4 thousand in labor income, and \$554.6 thousand in value added. Accounting for both the direct and secondary effects, spending by nonlocal visitors for Alternative 2 would generate total economic impacts of 29 jobs, \$858.4 thousand in labor income, and \$1.4 million in value added.

Table 6-7. Average Annual Impacts of Nonlocal Visitor Spending by Activity for Alternative 2

Alternative 2	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Priority uses			
Fishing			
Direct effects	1	\$36.4	\$58.7
Secondary effects	1	\$20.8	\$36.6
<i>Total effect</i>	2	\$57.2	\$95.3

Alternative 2	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Hunting (big game, waterfowl, and other migratory birds)			
Direct effects	1	\$17.9	\$28.6
Secondary effects	0	\$9.8	\$17.3
<i>Total effect</i>	<i>1</i>	<i>\$27.7</i>	<i>\$45.8</i>
Nonconsumptive (wildlife watching and photography, environmental education, and interpretation)			
Direct effects	5	\$149.8	\$244.8
Secondary effects	3	\$91.0	\$159.8
<i>Total effect</i>	<i>8</i>	<i>\$240.8</i>	<i>\$404.6</i>
Nonpriority uses			
Nonwildlife-dependent boating			
Direct effects	6	\$179.8	\$293.1
Secondary effects	3	\$95.6	\$169.9
<i>Total effect</i>	<i>9</i>	<i>\$275.4</i>	<i>\$463.0</i>
Swimming and other beach activities			
Direct effects	4	\$112.2	\$183.4
Secondary effects	2	\$68.1	\$119.7
<i>Total effect</i>	<i>6</i>	<i>\$180.3</i>	<i>\$303.1</i>
Land-based nonwildlife-dependent (walking, jogging, and other activities (e.g., picnicking))			
Direct effects	2	\$48.0	\$78.5
Secondary effects	1	\$29.2	\$51.3
<i>Total effect</i>	<i>3</i>	<i>\$77.2</i>	<i>\$129.8</i>
Aggregate Nonlocal visitation			
Direct effects	19	\$544.1	\$887.1
Secondary effects	10	\$315.4	\$554.6
<i>Total effect</i>	<i>29</i>	<i>\$858.6</i>	<i>\$1,441.7</i>

Table 6-8 summarizes the economic impacts associated with current nonlocal Refuge visitation by activity for Alternative 3. Under Alternative 3, nonlocal Refuge visitors would spend approximately \$1.4 million in the local economy annually. This spending would directly account for 13 jobs, \$377.8 thousand in labor income, and \$616.6 thousand in value added in the local economy. The secondary or multiplier effects would generate an additional six jobs, \$222.5 thousand in labor income, and \$391.7 thousand in value added. Accounting for both the direct and secondary effects, spending by nonlocal visitors for Alternative 3 would generate total economic impacts of 19 jobs, \$600.3 thousand in labor income, and \$1 million in value added.

Table 6-8. Average Annual Impacts of Nonlocal Visitor Spending by Activity for Alternative 3

Alternative 3	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Priority uses			
Fishing			
Direct effects	1	\$17.5	\$28.2
Secondary effects	0	\$10.0	\$17.6
<i>Total effect</i>	<i>1</i>	<i>\$27.5</i>	<i>\$45.8</i>
Hunting (big game, waterfowl, and other migratory birds)			
Direct effects	0	\$10.1	\$16.2
Secondary effects	0	\$5.5	\$9.8
<i>Total effect</i>	<i>0</i>	<i>\$15.6</i>	<i>\$26.0</i>
Nonconsumptive (wildlife watching and photography, environmental education, and interpretation)			
Direct effects	5	\$146.8	\$240.0
Secondary effects	3	\$89.2	\$156.7

Alternative 3	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
<i>Total effect</i>	8	\$236.0	\$396.7
Nonpriority uses			
Nonwildlife-dependent boating			
Direct effects	3	\$77.2	\$125.8
Secondary effects	1	\$41.1	\$72.9
<i>Total effect</i>	4	\$118.3	\$198.7
Swimming and other beach activities			
Direct effects	3	\$84.1	\$137.6
Secondary effects	1	\$51.1	\$89.8
<i>Total effect</i>	4	\$135.2	\$227.4
Land-based nonwildlife-dependent (walking, jogging, and other activities (e.g., picnicking))			
Direct effects	1	\$42.1	\$68.8
Secondary effects	1	\$25.6	\$44.9
<i>Total effect</i>	2	\$67.7	\$113.7
Aggregate Nonlocal visitation			
Direct effects	13	\$377.8	\$616.6
Secondary effects	6	\$222.5	\$391.7
<i>Total effect</i>	19	\$600.3	\$1,008.3

Table 6-9 summarizes the economic impacts associated with current nonlocal Refuge visitation by activity for Alternative 4. Under Alternative 4, nonlocal Refuge visitors would spend approximately \$631.0 thousand in the local economy annually. This spending would directly account for five jobs, \$164.5 thousand in labor income, and \$268.3 thousand in value added in the local economy. The secondary or multiplier effects would generate an additional two jobs, \$98.6 thousand in labor income, and \$173.5 thousand in value added. Accounting for both the direct and secondary effects, spending by nonlocal visitors for Alternative 4 would generate total economic impacts of seven jobs, \$263.1 thousand in labor income, and \$441.8 thousand in value added.

Table 6-9. Average Annual Impacts of Nonlocal Visitor Spending by Activity for Alternative 4

Alternative 4	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Priority uses			
Fishing			
Direct effects	0	\$9.5	\$15.4
Secondary effects	0	\$5.5	\$9.6
<i>Total effect</i>	0	\$15.0	\$25.0
Hunting (big game, waterfowl, and other migratory birds)			
Direct effects	0	\$13.3	\$21.2
Secondary effects	0	\$7.1	\$12.7
<i>Total effect</i>	0	\$20.4	\$33.9
Nonconsumptive (wildlife watching and photography, environmental education, and interpretation)			
Direct effects	4	\$123.9	\$202.5
Secondary effects	2	\$75.2	\$132.2
<i>Total effect</i>	6	\$199.1	\$334.7
Nonpriority uses			
Nonwildlife-dependent boating			
Direct effects	0	\$0.0	\$0.0
Secondary effects	0	\$0.0	\$0.0
<i>Total effect</i>	0	\$0.0	\$0.0

Alternative 4	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Swimming and other beach activities			
Direct effects	0	\$0.0	\$0.0
Secondary effects	0	\$0.0	\$0.0
<i>Total effect</i>	<i>0</i>	<i>\$0.0</i>	<i>\$0.0</i>
Land-based nonwildlife-dependent (walking, jogging, and other activities (e.g., picnicking))			
Direct effects	1	\$17.8	\$29.2
Secondary effects	0	\$10.8	\$19.0
<i>Total effect</i>	<i>1</i>	<i>\$28.6</i>	<i>\$48.2</i>
Aggregate Nonlocal visitation			
Direct effects	5	\$164.5	\$268.3
Secondary effects	2	\$98.6	\$173.5
<i>Total effect</i>	<i>7</i>	<i>\$263.1</i>	<i>\$441.8</i>

Table 6-10 summarizes the total economic impacts associated with current nonlocal Refuge visitation by alternative. The total annual average economic impacts for Alternative 2 would be similar to Alternative 1. The impacts for Alternative 3 would be approximately 30 percent less than the impacts for Alternative 1. Alternative 4 would have the largest decrease in impacts (approximately 70 percent) compared to Alternative 1.

Table 6-10. Average Annual Impacts of Nonlocal Visitor Spending by Alternative

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Alternative 1			
Direct effects	19	\$538.4	\$877.6
Secondary effects	9	\$309.7	\$546.2
<i>Total economic impact</i>	<i>28</i>	<i>\$848.1</i>	<i>\$1,423.8</i>
Alternative 2			
Direct effects	19	\$544.1	\$887.1
Secondary effects	10	\$314.5	\$554.6
<i>Total economic impact</i>	<i>29</i>	<i>\$858.6</i>	<i>\$1,441.7</i>
Alternative 3			
Direct effects	13	\$377.8	\$616.6
Secondary effects	6	\$222.5	\$391.7
<i>Total economic impact</i>	<i>19</i>	<i>\$600.3</i>	<i>\$1,008.3</i>
Alternative 4			
Direct effects	5	\$164.5	\$268.3
Secondary effects	2	\$98.6	\$173.5
<i>Total economic impact</i>	<i>7</i>	<i>\$263.1</i>	<i>\$441.8</i>

6.6.4 Impacts from Refuge Administration

6.6.4.1 Personal Purchases by Staff

Refuge employees reside and spend their salaries on daily living expenses in the local area, thereby generating impacts within the local economy. Household consumption expenditures consist of payments by individuals and households to industries for goods and services used for personal consumption. The IMPLAN modeling system contains household consumption spending profiles that

account for average household spending patterns by income level. These profiles allow for leakage of household spending to outside the region. The IMPLAN household spending pattern for households earning \$35 to \$50 thousand per year was used to reflect the average salary of full-time permanent employees at the Refuge (\$46 thousand per year). Table 6-11 lists current Refuge staffing and additional positions needed under Alternatives 2, 3, and 4.

Table 6-11. Current Staffing and Additional Positions Needed to Implement the CCP

Current Refuge Staff Positions (Alternative 1)
Refuge Manager
Assistant Refuge Manager
Visitor Services Manager
Wildlife Biologist
Maintenance Worker
Administrative Assistant
Office Aid
Youth Conservation Corps Leader (full-time seasonal)
Youth Conservation Corps (4 full-time seasonal positions)
Environmental Education Specialist (Intern)
Volunteer Coordinator (Intern)
Biological Science Technician (Intern)
Additional Positions Needed to Implement the CCP under Alternatives 2,3, 4
*Biological Science Technician
*Environmental Education Specialist
*Volunteer Coordinator
Law Enforcement Officer

*If these positions were funded, the current interns would not be necessary.

Refuge personnel estimate that annual salaries total around \$524.6 thousand for Alternative 1 and would increase to \$711.1 thousand under Alternatives 2, 3, and 4. Table 6-12 shows the economic impacts associated with spending of salaries in the local two-county area by Refuge employees under all alternatives. For Alternative 1, salary spending by Refuge personnel would generate additional secondary effects (i.e., additional non-refuge jobs in the local economy) of four jobs, \$141.1 thousand in labor income, and \$254.7 thousand in value added in the local economy. Alternatives 2, 3, and 4 would generate additional secondary effects of five jobs, \$191.2 thousand in labor income, and \$345.2 thousand in value added in the local economy.

Table 6-12. Annual Local Impacts of Salary Spending by Deer Flat NWR Personnel by Alternative

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Alternative 1			
Direct effects	0	\$0.0	\$0.0
Secondary effects	4	\$141.1	\$254.7
<i>Total economic impact</i>	<i>4</i>	<i>\$141.1</i>	<i>\$254.7</i>
Alternatives 2, 3, and 4			
Direct effects	0	\$0.0	\$0.0
Secondary effects	6	\$191.2	\$345.2
<i>Total economic impact</i>	<i>6</i>	<i>\$191.2</i>	<i>\$345.2</i>

Note: There are no direct effects to employment because direct effects are measured as increases in off-Refuge employment.

6.6.4.2 Work-related Purchases

A wide variety of supplies and services are purchased for Refuge operations and maintenance activities. Refuge purchases made in the local two-county area contribute to the local economic impacts associated with the Refuge. Major local expenditures include supplies and services related to annual maintenance costs for trails, buildings and signage, and small equipment; auto repairs, parts, and fuel; and utilities. Current Refuge nonsalary recurring expenditures average approximately \$204.7 thousand per year. Average annual costs (including recurring costs and the annual average of one-time project costs in 2011 dollars over the life of the CCP) are anticipated to increase by \$83.8 thousand for Alternative 1, \$397.0 thousand for Alternative 2, \$832.8 thousand for Alternative 3, and \$362.6 thousand for Alternative 4. Total average annual nonsalary costs would total \$288.5 thousand for Alternative 1, \$601.7 thousand for Alternative 2, \$1.04 million for Alternative 3, and \$567.3 thousand for Alternative 4. The large increases in costs under Alternative 3 are related to the construction of a boardwalk. According to Refuge records, approximately 80 percent of the annual nonsalary budget expenditures are spent on goods and services purchased in the local two-county area. Table 6-13 shows the economic impacts associated with work-related expenditures in local communities near the Refuge.

Table 6-13. Local Economic Impacts of Refuge-related Purchases by Alternative

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Alternative 1			
Direct effects	2	\$76.5	\$100.1
Secondary effects	1	\$46.4	\$79.2
<i>Total economic impact</i>	3	<i>\$122.9</i>	<i>\$179.3</i>
Alternative 2			
Direct effects	5	\$177.4	\$212.9
Secondary effects	3	\$103.7	\$176.3
<i>Total economic impact</i>	8	<i>\$281.1</i>	<i>\$389.2</i>
Alternative 3			
Direct effects	9	\$326.9	\$385.5
Secondary effects	6	\$209.7	\$348.9
<i>Total economic impact</i>	15	<i>\$536.6</i>	<i>\$734.4</i>
Alternative 4			
Direct effects	4	\$165.4	\$199.2
Secondary effects	3	\$95.1	\$162.3
<i>Total economic impact</i>	7	<i>\$260.5</i>	<i>\$361.5</i>

6.6.5 Summary of Economic Impacts for Alternative 1 (Status Quo)

Table 6-14 summarizes the direct and total economic impacts in the two-county area of Refuge management activities for Alternative 1. Under Alternative 1, management activities directly related to Refuge operations would generate an estimated 21 jobs, \$616.0 thousand in labor income, and \$979.5 thousand in value added in the local economy. Including direct, indirect, and induced effects (i.e., secondary effects), all Refuge activities generate a total economic impact of 35 jobs, \$1.1 million in labor income, and \$1.8 million in value added. In 2009, for the local two-county area, total labor income was estimated at \$14.8 billion, and total employment was estimated at 367.7 thousand jobs (2009 IMPLAN data). Thus, total economic impacts associated with Refuge operations under Alternative 1 represent less than 0.01 percent of total income and total employment in the overall

economy of the two-county area. Total economic effects of Refuge operations play a larger role in the communities in Canyon County near the Refuge where most of the Refuge-related expenditures and public-use-related economic activity occur. For more information about local effects, see Appendix A of the Regional Economic Impacts of Current and Proposed Management Alternatives for Deer Flat National Wildlife Refuge located in Appendix M.

Table 6-14. Summary of All Refuge Management Activities for Alternative 1

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	2	\$77.8	\$101.9
Total effects ^b	7	\$265.9	\$436.8
Nonlocal Public Use Activities			
Direct effects	19	\$538.2	\$877.6
Total effects ^b	28	\$847.8	\$1,423.8
Aggregate Impacts			
Direct effects	21	\$616.0	\$979.5
Total effects ^b	35	\$1,113.6	\$1,860.6

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

6.6.6 Summary of Economic Impacts for Alternative 2 (Preferred Alternative)

Table 6-15 summarizes the direct and total economic impacts in the two-county area of Refuge management activities for Alternative 2. Under Alternative 2, management activities directly related to Refuge operations would generate an estimated 24 jobs, \$722.7 thousand in labor income, and \$1.1 million in value added in the local economy. Including direct, indirect, and induced effects, all Refuge activities would generate a total economic impact of 43 jobs, \$1.3 million in labor income, and \$2.2 million in value added. In 2009, total labor income was estimated at \$14.8 billion and total employment was estimated at 367.7 thousand jobs for the local two-county area (2009 IMPLAN data). Thus, total economic impacts associated with Refuge operations under Alternative 2 represent less than 0.01 percent of total income and total employment in the overall economy of the two-county area. Total economic effects of Refuge operations play a larger role in the communities in Canyon County near the Refuge where most of the Refuge-related expenditures and public-use-related economic activity occurs. For more information about local effects, see Appendix A of the Regional Economic Impacts of Current and Proposed Management Alternatives for Deer Flat National Wildlife Refuge located in Appendix M.

Table 6-15. Summary of All Refuge Management Activities for Alternative 2

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	5	\$178.8	\$214.7
Total effects ^b	14	\$474.2	\$737.3
Nonlocal Public Use Activities			
Direct effects	19	\$543.9	\$887.1
Total effects ^b	29	\$858.4	\$1,441.6
Aggregate Impacts			
Direct effects	24	\$722.7	\$1,101.8
Total effects ^b	43	\$1,332.6	\$2,178.9

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

Table 6-16 summarizes the change in economic effects associated with Refuge operations under Alternative 2 as compared to Alternative 1. Due to increases in visitation and administration, Alternative 2 would generate eight more jobs, \$219.0 thousand more in labor income, and \$318.3 thousand more in value added as compared to Alternative 1.

Table 6-16. Change in Economic Impacts under Alternative 2 Compared to Alternative 1

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	+3	+\$101.0	+\$112.8
Total effects ^b	+7	+\$208.3	+\$300.5
Nonlocal Public Use Activities			
Direct effects	no change	+\$5.7	+\$9.5
Total effects ^b	+1	+\$10.6	+\$17.8
Aggregate Impacts			
Direct effects	+3	+\$106.7	+\$122.3
Total effects ^b	+8	+\$219.0	+\$318.2

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

6.6.7 Summary of Economic Impacts for Alternative 3

Table 6-17 summarizes the direct and total economic impacts in the two-county area of Refuge management activities for Alternative 3. Under Alternative 3, Refuge management activities directly related to Refuge operations would generate an estimated 22 jobs, \$706.1 thousand in labor income, and \$1.0 million in value added in the local economy. Including direct, indirect, and induced effects, all Refuge activities would generate a total economic impact of 40 jobs, \$1.3 million in labor income, and \$2.1 million in value added. In 2009, total labor income was estimated at \$14.8 billion and total employment was estimated at 367.7 thousand jobs for the local two-county area (2009 IMPLAN data). Thus, total economic impacts associated with Refuge operations under Alternative 3 represent less than 0.01 percent of total income and total employment in the overall economy of the two-county area. Total economic effects of Refuge operations play a larger role in the communities in Canyon County near the Refuge where most of the Refuge-related expenditures and public-use-related economic activity occurs. For more information about local effects, see Appendix A of the Regional Economic Impacts of Current and Proposed Management Alternatives for Deer Flat National Wildlife Refuge located in Appendix M.

Table 6-17. Summary of All Refuge Management Activities for Alternative 3

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	9	\$328.3	\$387.4
Total effects ^b	21	\$729.8	\$1,082.5
Nonlocal Public Use Activities			
Direct effects	13	\$377.8	\$616.6
Total effects ^b	19	\$600.1	\$1,008.2
Aggregate Impacts			
Direct effects	22	\$706.1	\$1,004.0
Total effects ^b	40	\$1,329.9	\$2,090.7

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

Table 6-18 summarizes the change in economic effects associated with Refuge operations under Alternative 3 as compared to Alternative 1. Due to substantial increases in Refuge administration (including the construction of a boardwalk), Alternative 3 would generate five more jobs, \$216,200 more in labor income, and \$230,100 more in value added as compared to Alternative 1.

Table 6-18. Change in Economic Impacts under Alternative 3 Compared to Alternative 1

	Employment (# full and part time jobs)	Labor Income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	+7	+\$250.5	+\$285.5
Total effects ^b	+14	+\$463.9	+\$645.7
Nonlocal Public Use Activities			
Direct effects	-6	-\$160.4	-\$261.0
Total effects ^b	-9	-\$247.7	-\$415.6
Aggregate Impacts			
Direct effects	+1	+\$90.0	+\$24.4
Total effects ^b	+5	+\$216.2	+\$230.1

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

6.6.8 Summary of Economic Impacts for Alternative 4

Table 6-19 summarizes the direct and total economic impacts in the two-county area of Refuge management activities for Alternative 4. Under Alternative 4, Refuge management activities directly related to Refuge operations would generate an estimated nine jobs, \$331,300 in labor income, and \$469,300 in value added in the local economy. Including direct, indirect, and induced effects, all Refuge activities would generate a total economic impact of 20 jobs, \$716,800 in labor income, and \$1.2 million in value added. In 2009, total labor income was estimated at \$14.8 billion and total employment was estimated at 367,700 jobs for the local two-county area (2009 IMPLAN data). Thus, total economic impacts associated with Refuge operations under Alternative 4 represent less than 0.01 percent of total income and total employment in the overall economy of the two-county area. Total economic effects of Refuge operations play a larger role in the communities in Canyon County near the Refuge where most of the Refuge-related expenditures and public-use-related economic activity occurs. For more information about local effects, see Appendix A of the Regional Economic Impacts of Current and Proposed Management Alternatives for Deer Flat National Wildlife Refuge located in Appendix M.

Table 6-19. Summary of All Refuge Management Activities for Alternative 4

	Employment (# full and part time jobs)	Labor Income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	4	\$166.8	\$201.0
Total effects ^b	13	\$453.6	\$709.5
Nonlocal Public Use Activities			
Direct effects	5	\$164.5	\$268.3
Total effects ^b	7	\$263.2	\$441.8
Aggregate Impacts			
Direct effects	9	\$331.3	\$469.3
Total effects ^b	20	\$716.8	\$1,151.3

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

Table 6-20 summarizes the change in economic effects associated with Refuge operations under Alternative 4 as compared to Alternative 1. Due to substantial decreases in visitation, Alternative 4 would generate 15 less jobs, \$396.8 thousand less in labor income, and \$709.4 thousand less in value added as compared to Alternative 1.

Table 6-20. Change in Economic Impacts under Alternative 4 Compared to Alternative 1

	Employment (# full and part time jobs)	Labor income (Thousands, \$2011)	Value Added (Thousands, \$2011)
Revenue Sharing and Refuge Administration^a			
Direct effects	+2	+\$89.0	+\$99.1
Total effects	+6	+\$187.7	+\$272.7
Nonlocal Public Use Activities			
Direct effects	-14	-\$373.7	-\$609.3
Total effects	-21	-\$584.6	-\$982.0
Aggregate Impacts			
Direct effects	-12	-\$284.6	-\$510.2
Total effects	-15	-\$396.9	-\$709.3

^a Staff salary spending and work-related purchases. ^b Total effects encompass direct, indirect, and induced effects.

6.7 Cumulative Effects

The Council on Environmental Quality's (CEQ) regulations for implementing the provisions of NEPA define several different types of effects that should be evaluated in an EIS, including direct, indirect, and cumulative ([40 C.F.R. 1508.7-1508.8](#)). Direct and indirect effects are addressed in the resource-specific sections of this Final CCP/EIS (Sections 6.1-6.4). This section addresses cumulative effects.

According to the CEQ, cumulative effects can result from the incremental effects of a project when added to other past, present, and reasonably foreseeable future projects in the area, regardless of the entity undertaking the action. Cumulative impacts can result from individually minor but cumulatively significant actions over a period of time. This analysis is intended to consider the interaction of activities at the Refuge and with other actions occurring over a larger spatial and temporal frame of reference.

It should be noted that the cumulative effects analysis has essentially been completed by virtue of comprehensive nature by which direct and indirect effects associated with implementing the various alternatives has been presented in the previous sections of this chapter and in the compatibility determinations (Appendix B). The analysis in this section primarily focuses on effects associated with reasonably foreseeable future events and/or actions regardless of what entity undertakes that action.

6.7.1 Potential Effects from Climate Change

If snowpacks decline and temperatures rise (Section 3.2 for more detail) lower lake levels may occur during spring and summer months. The lower levels could negatively impact on-water nesting birds, spawning fish, and other wildlife that rely on emergent vegetation for feeding, resting, nesting, or breeding. If water levels and vegetation patterns change, protections under the preferred alternative would be able to adapt to the change by shifting with wildlife use. Protections under Alternatives 3 and 4 are stationary and could result in protecting unproductive habitat as water levels fall.

Lower river levels, hotter temperatures, and the potential for more frequent wildland fires could negatively impact the upland and riparian vegetation on the Refuge. Increases in invasive and undesirable exotic species may be seen, as well as loss of native vegetation. The cheatgrass-infested uplands of Lake Lowell Unit would burn rapidly and the increase in temperature would make it even more difficult for native plants to outcompete the invasives during fire rehabilitation. All alternatives propose the use of fire breaks to reduce the amount of damage caused by wildfires at the Lake Lowell Unit.

Higher water levels in the fall and winter should have a negligible impact to most wildlife species. However, deer using the Refuge for cover may move to adjacent private lands as water levels rise and dry upland habitat becomes limited.

Lower water levels would also shorten the boating season and negatively affect shoreline fishing access. Depending on the amount of water available in the lake, fishing and wildlife observation docks proposed in the action alternatives may reduce the impacts to these uses. However, extremely low water and high water temperature can result in increased mortality of sport fish in the lake.

If water levels increase in the fall, current uplands may be inundated on the south side of the lake. This could negatively impact deer hunting and upland game hunting (in Alternatives 1 and 2) by reducing the area available for these activities. Higher water levels may also negatively impact waterfowl hunting on the south side by making it more difficult to reach the open water of the lake through inundated riparian zones.

6.7.2 Effects from Reasonably Foreseeable Events and Activities from Others

Throughout this analysis, effects to resources of concern have been considered. The overall effect of an alternative stemming from the combination of individual actions included in that alternative was assessed. For example, the cumulative effects of the hunt program are covered where applicable in previous sections of this chapter. If no effect from an activity (such as hunting) is listed or discussed (e.g., as in Section 6.5.11, Effects from Public Use and Public Use Management Actions on Water-based Nonwildlife-dependent Recreation), this means that in our judgment, that activity is not considered to have any effect on the resource in question.

6.7.2.1 Effects from Increased Development and Population Growth

As described in Chapter 4, cumulatively, there has been a substantial modification to native habitats of the Treasure Valley over the past 100 years, including changes to hydrology, vegetation (especially the influx of invasive species), and fire regimes. As described in Section 6.3.2, regional human populations are expected to continue to grow throughout the life of the CCP. Given these trends, region-wide biological integrity may be at risk. Over time, the Refuge, although relatively small, may become increasingly valuable for the persistence of native wildlife and habitat. The lack of increased management in many habitats under Alternative 1 could cause future degradation of Refuge habitats, leaving the Refuge less able to accommodate increasing wildlife needs as surrounding lands are developed. Active improvement of riparian, open water, mudflat, upland, and wetland habitats in the action alternatives would increase or maintain the value of Refuge lands and waters for a wide variety of native wildlife.

The increase in regional population is expected to be mirrored by an increase in Refuge visitation under Alternatives 1 and 2. The lack of public use regulations under Alternative 1 would be expected to make it increasingly difficult for wildlife, especially nesting waterbirds, to use the Refuge successfully. The increase in visitation without adequate increases in recreation management could reduce the number and/or diversity of wildlife and leave the Refuge less capable of accommodating increasing wildlife needs. All action alternatives increase public use management to reduce disturbance to wildlife during their most sensitive life stages (e.g., migrating, wintering, breeding, and nesting).

The action alternatives emphasize habitat improvements for waterfowl, other migratory birds and other wildlife, and would improve the ability of the Refuge to provide nesting habitat for migratory waterbirds, passerines, and raptors; feeding areas for shorebirds and other seasonal migrants; and habitat improvements for other native species. However, actions proposed under the Final CCP/EIS would not reverse or halt the regional trend toward reduced biological integrity within the region. Under all alternatives, biological diversity (the number of species present on the Refuge) would probably remain about the same, with some potential reduction possible in Alternative 1.

6.7.2.2 Effects from Public Use Programs

Although mortality would occur to some wildlife under the Refuge's hunt program, the analysis presented previously in this chapter supports the conclusion that there would be no adverse population-level impacts to hunted or nonhunted wildlife species, even when added to other hunt programs regionally or nationally.

6.7.2.3 Effects from Water Quality

As discussed above, Lake Lowell is an impaired water body with multiple inlets coming from surrounding agricultural land containing high concentrations of fertilizers and chemicals associated with farming practices. Without intervention, we can reasonably expect continued inflow and accumulation of sediments and contaminants. The recently published TMDL (IDeq 2010) will attempt to improve water quality through voluntary actions on private lands. Several CCP strategies are included in all action alternatives to work with partners toward investigating and improving Lake Lowell water quality issues. If water quality continues to deteriorate, increases in phosphorus, sedimentation, and other contaminants may cause increasing negative impacts to visitors and wildlife. If these increases result in a threat to human health (e.g., blue-green algae blooms) recreation may need to be curtailed. Increasing contaminants and sedimentation may reduce nesting success, destroy nesting habitats, or impact food resources for wildlife.

6.7.2.4 Effects from New Boat Trailer Parking Facilities

Canyon County Parks, Recreation, and Waterways is planning to expand available boat trailer parking at the Lake Lowell Park across from the east Upper Dam boat launch. Additional parking may increase on-water use, especially in the East Pool. The lack of public use regulations under Alternative 1 would be expected to make it increasingly difficult for wildlife, especially nesting waterbirds, to use the Refuge successfully. The increase in visitation without adequate increases in recreation management could reduce the number and/or diversity of wildlife and leave the Refuge less capable of accommodating increasing wildlife needs. The no-wake zones and closures provided under the action alternatives should reduce impacts from increased use. The increase in visitation could also reduce the quality of visitor experiences, caused by increased crowding.

6.7.2.5 Effects from the Snake River Canyon Scenic Byway

The Snake River Canyon Scenic Byway committee developed a Corridor Management Plan (CMP) in 2009. The Byway emphasizes agricultural heritage, and includes portions of the Snake River Islands Unit of the Refuge along the Byway Loop, as well as a Super Side Trip to the Lake Lowell Unit. Implementation of the Byway CMP during the life of the CCP would be expected to include potential facilities development (e.g., overlooks), marketing, and signage that could increase awareness of and visitation to both units of the Refuge. Increases in recreation management proposed under the action alternatives should reduce impacts from the potential increase in use.

6.7.2.6 Effects from the Snake River Water Trail

Canyon County Parks, Recreation, and Waterways and many other partners have recently developed a plan for implementing a Snake River Water Trail from Glenns Ferry, Idaho, to Farewell Bend, Oregon, which completely includes the Snake River Islands Unit of the Refuge. A water trail is a water route that provides recreational and educational opportunities for motorized and nonmotorized boaters and commercial opportunities for river communities. The plan includes proposals for facilities development as well as marketing and promotion of the trail. Implementation of the Water Trail may increase awareness of and visitation to Refuge islands, including clarification of Refuge regulations on Water Trail signage and publications. The extension of closures on islands with goose, heron, and/or gull nesting should help to reduce negative impacts to wildlife during their most sensitive life stages.

6.8 Other Effects

6.8.1 Potential Impacts on Adjacent Lands and their Associated Natural Resources

6.8.1.1 Effects from Increased Invasive Species

Alternative 1 would continue maintenance of most Refuge habitats with current management approaches. Over time, the lack of increased invasive species removal, introduction of new treatment techniques, and targeted removal programs would be expected to cause an increase in invasive species and a decrease in the abundance of native vegetation on the Refuge. On-refuge invasive species would also be expected to spread to adjacent lands and impact Refuge neighbors or lands downstream of the Snake River Islands Unit. Under all action alternatives, increased efforts would be made to reduce invasive species populations on the Refuge, even though they may become more prevalent on surrounding lands.

6.8.2 Potential Impacts to Nearby Residents

6.8.2.1 Effects from Public Use Management

The Service would improve the availability and quality of wildlife-dependent recreation, but within a regional context there would be little cumulative difference in recreational opportunity. Given that Lake Lowell is the only large lake in Canyon County, the removal of nonwildlife-dependent recreation from Alternative 4 is expected to make a difference in the availability of on-water

activities in the county. Although the other alternatives limit the scope of nonwildlife-dependent use, none remove the uses entirely from the Refuge and are therefore not expected to create a cumulative difference in recreational opportunity.